WESTERN ELECTRICIAN

EVERY SATURDAY

VOLUME XLIII.

NUMBERS 1—18

July 4—October 31, 1908

ELECTRICIAN PUBLISHING COMPANY
CHICAGO

INDEX.

[In this Index subjects, titles and authors' names are all included, for convenience, in one alphabetically arranged list. Where necessary, articles are indexed under two or more headings. Often the Index is consulted by persons who have only a vague or general idea of the title or nature of the article sought. In such case a search under every heading that might relate to the subject should be made. A number of cross-references are given to assist in this purpose. The asterisk (*) is equivalent to "Illustrated."]

A

B

C

D

E

F

G

H

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, JULY 4, 1908 No. 1

RECENT ELECTRICAL ILLUMINATION IN PEORIA.

The grand camp of the Modern Woodmen of America held its meeting in Peoria during the week beginning June 15th, and the electrical illumination was a feature. The committee in charge caused to be placed along the streets the letters M W A three feet high and five lights high. Under the letters were festoons of 12 lights each. These letters were repeated for a long distance. The picture at the left shows a night view of Adams Street. The large building shown prominently in this picture is a department store, a front view of which, as electrically decorated, is shown on the right. The work of decorating this building was performed by the firm's own decorators. The roof sign shown is the largest in Peoria. It is 15 feet high and is permanent, being mounted upon angle-iron framework. The decorations of this firm were the most elaborate in the city.

The street illumination was carried out by a local contractor, and the current for the lights was furnished by the Peoria Gas and Electric Company direct from its secondary distribution system, being on the three-wire, 104-208-volt system. The letters were lighted on both sides, fortunately being such that they read the same from both sides.

In the street illumination there were also several axes hung at street intersections and lighted from both sides. In the entire street illumination there were 6,800 lights, of which 2,200 were four candlepower and the remainder two candlepower. Merchants also used additional electric lights in several instances, and with these the total number of special lights in use for the meeting was a little less than 8,000. The Peoria Gas and Electric Company displayed a large ax upon the top of its sign. This emblem was 50 feet long and 12 feet high and was studded with four-candlepower lamps.

The camp was situated at the end of the Monroe Street car line, and the Peoria Railway Company made a record for the handling of the traffic. The largest day's business was done on the day of the parade, when 101,709 fares were rung up, with a total of 98 cars in service, of which 50 were the regular cars, the others being extra. During the week 465,882 passengers were handled. As a slight token of appreciation of the care exercised by the employes, General Manager S. L. Nelson set aside the sum of $100 for the sick fund of the men. The travel was handled without an accident.

Night View on Adams Street.

Decorations on a Prominent Department Store.

ELECTRICAL ILLUMINATION AT PEORIA IN HONOR OF MODERN WOODMEN OF AMERICA.

CHANGED CONDITIONS IN SAN FRANCISCO.

Before the great fire, competition in electric lighting was almost at an end in San Francisco, and comparatively few isolated electric plants remained in operation. The San Francisco Gas and Electric Company had made rates that convinced the owners of buildings that it was cheaper to buy current than to generate it on a small scale. Now, however, the isolated plant in the basement, supplying one or more buildings, and the small central-station plant in the heavy business district, are having their day once more. The Mills Building plant is running again. The Kohl Building plant is now being connected up so as to supply several other buildings. An isolated plant is now in operation in the 12-story Alaska Commercial Building. The Palace Hotel Company recently closed contracts for a complete electric plant to supply the large new building.

The Consumers' Light and Power Company, which was recently financed in San Francisco, has closed contracts for a direct-current central-station plant, which is to be installed in the basement of the new eight-story Whitney Building, in Geary Street, between Stockton Street and Grant Avenue. Frederick G. Cartwright, who for a number of years has been prominently identified with various electric companies of the city, is president and general manager of the new corporation. James Fisher, formerly the secretary of the Mutual Electric Light Company, is the vice-president and treasurer. Underground mains will be laid to supply buildings within a moderate distance with electric current and steam heat. A vacuum service will also be given for air cleaning in buildings. This company will be the first in the city to engage regularly in the business of supplying steam heat to customers generally from mains connected with a central station. To begin with, about 2,600 linear feet of steam-heat distribution will be laid. Both exhaust-steam and hot-water systems will be installed. Enough long-term lighting contracts have been secured to place the project on a sure footing.

The electric generating plant of the Consumers' company will be of the Westinghouse direct-connected, 220-volt, three-wire, direct-current type in four units, with a total rated capacity of 1,025 kilowatts. This plant will be capable of considerable extension, and additional plants may be installed in other locations. Customers will be supplied with electric light and steam heat by September 1st. American Ball engines will be used, and the boiler plant, with its accessories, will be furnished through Charles C. Moore & Co.

FAN-MOTOR TRADE GOOD.

It is encouraging to note that in spite of unfavorable weather earlier in the season the fan-motor trade is reported as excellent among the electrical men of Chicago. There is a month of good fan weather left, unless there should be a reversal of usual weather conditions, and the year promises to be a record-breaker. Dealers that ordinarily take about 200 fans up to this time of year are reported as having bought about 500 to supply the 1908 demand. It is difficult for the manufacturers and supply houses to keep stock up in certain lines, owing to the rather unexpected heaviness of the demand. This difficulty is enhanced by the large number of types of small electric fans—fans for direct current and alternating current, for 110 volts and 220 volts, for 25 cycles, 60 cycles and 133 cycles, for desks, brackets, pedestals and ceilings, for eight-inch, 12-inch and other sizes, for oscillating and non-oscillating types and for various styles and pitch of blades. When the possible combinations from these various diversities are taken into account, it is seen that a brisk demand for fan motors keeps the manufacturer and dealer busy.

Not only for desk and ceiling fans but for the large ventilating fans and blowers for mines and factories where dangerous or disagreeable fumes or odors are present is the demand unusually good. In mines, in particular, disastrous explosions of comparatively recent date have shown the need of the best method of ventilation, and this has benefited the maker of electric blower and exhaust fans.

STEINMETZ'S SYSTEM OF VOLTAGE REGULATION.

On June 16th a patent for a system of voltage regulation was granted to Dr. Charles P. Steinmetz and assigned by him to the General Electric Company. The following description of the system is taken from the inventor's patent specification:

The invention relates to the generation and distribution of alternating currents and has for its object the provision of means whereby the voltage of the generating source may be maintained constant with variation of load, or if desired may be made to rise as the load comes on, in order thereby to maintain a constant potential at some more or less distant point on the distribution system. In carrying out this method of regulation in practice use is made of a generator having its field member excited by low-frequency multiphase alternating currents. The exciting circuits carrying the low-frequency currents are connected to a suitable exciting machine of the desired frequency, say, four and six cycles per second, and in the leads extending to this exciting machine are connected in series suitable adjustable resistances.

If the rotating member of the generator be now rotated in such a manner that currents produced in the generating windings of the generator have a frequency corresponding to the difference of the two frequencies due respectively to the mechanical rotation in the machine and to the rotation of the field due to the exciting currents, then the generator operates after the manner characteristic of an induction motor driven above synchronism. In this case the two members of the generator each generate current, which flows in the case of one member to the distribution circuit and in the case of the other member to the exciter. The currents flowing to the exciter traverse the resistances in the exciter circuits and thereby drop in potential, so that it will be seen that the voltage of the exciter circuit near the generator is higher than at the exciter.

As the current delivered by the main generator to the distribution system increases in value the current flowing into the exciter circuit from the generator increases correspondingly in value because the currents in the rotor and stator of the main generator are produced by the same flux. Therefore as the load on the main generator increases the voltage supplied to the exciter circuits by the main generator increases likewise, while the voltage supplied to the consumption circuit of the main generator also increases. Now by varying the resistance in the exciter circuit it is evident, assuming the voltage of the exciter to be maintained constant or approximately so, that the voltage of the main generator may thereby be adjusted. This result is accomplished by automatic means responsive to the voltage of that portion of the distribution system at which it is desired to maintain a constant potential.

In the accompanying drawing the main generator is indicated in general at (1) and consists in the present case of a machine resembling in general construction an ordinary induction motor. Each of the two members of the machine is provided with a multiphase winding, in this case a three-phase winding. The terminals extending from the stator of the machine are indicated at (2), (3) and (4), respectively, while the terminals from the rotor are indicated at (5), (6) and (7), and connect through suitable collector rings and brushes (8), (9) and (10), to points in the winding on the rotor (11). The machine may be driven from any suitable source of power, as, for example, by means of a belt (12).

The stator is in the present instance chosen as the generating member of the machine, and the leads therefrom connect to any suitable distribution system, indicated here as supplying banks of lamps (13), (14) and (15) and motors, such, for example, as the induction motor (16). These translating devices are merely illustrative of some suitable load.

The rotor of the machine, which serves in this case as the exciting member, is connected through its leads to an exciter (17) of low-frequency multiphase currents. This exciter may be of any suitable construction, and is driven at a rate such as to produce low-frequency multiphase exciting voltages. The direct-current field excitation of the exciter is, in the present case, received from a small direct-current exciter (18), the leads of which are indicated at (19) and (20). In the exciter leads, extending between the generator and exciter (17), there are connected in series therewith, respectively, adjustable resistances (21), (22) and (23). These resistances may be adjusted semi-permanently by means of shiftable contacts (24), (25) and (26).

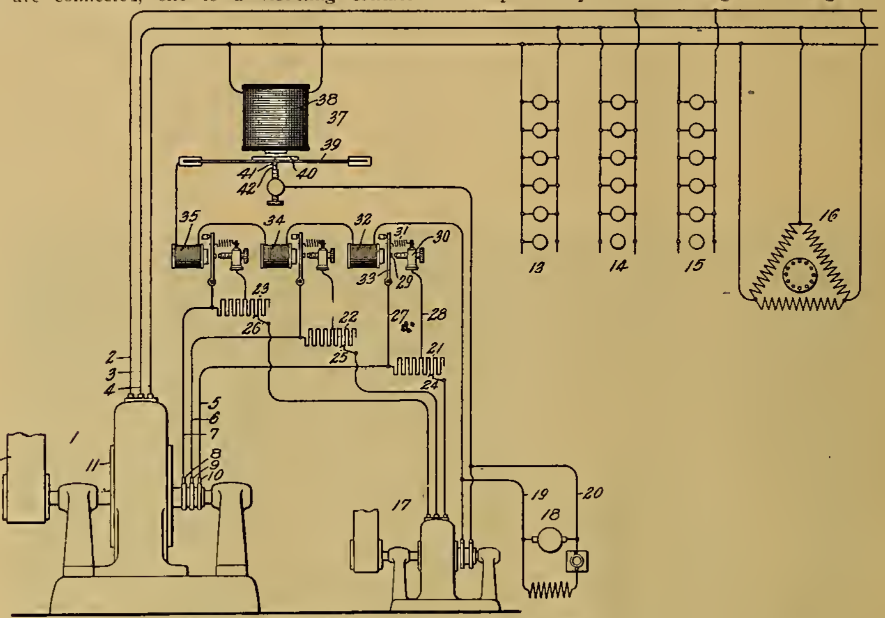
In order to adjust the resistances in response to the variation of voltage on the main generator system, there is provided for each resistance a vibratory short-circuiting device. Thus, for example, in the case of the resistance (21), two leads (27) and (28), one from one terminal of the resistance and the other from some intermediate point, are connected, one to a vibrating contact (29) and the other to an adjustable fixed contact (30). A spring (31) urges these contacts together and is so insulated as to avoid electrically connecting them. A relay magnet (32) when energized moves the armature (33), carrying the contact point (29), so as to break engagement with the fixed contact (30), and thereby open-circuit that portion of the resistance comprised between the leads (27) and (28). When de-energized the magnet allows the armature to return and short-circuit this portion of the resistance. In a similar manner the resistances (22) and (23) are provided with short-circuiting devices, which, being the same in character as that already described, require no further description. They are indicated at (34) and (35).

The relay magnets of the three short-circuiting devices are connected in series and receive current from any suitable source, as, for example, from the exciter (18). In order to control these relay magnets use is made of the main vibrator (37), consisting of a magnet (38), connected across two of the leads of the distribution system and co-operating with a tightly stretched ribbon or strip (39). This carries an armature (40), which may be attracted by the magnet, and it also carries a contact (41), co-operating or engaging an adjustable fixed contact (42). When these contacts are together the relay magnets (32), (34) and (35) are energized and thereby attract their corresponding armatures, thus open-circuiting the shunts about the respective resistances (21), (22) and (23). The entire resistances are thus in circuit. When contacts (41) and (42) separate, the relay magnets close the short-circuits about the resistances.

Now these resistances are so chosen that when the short-circuits are opened there will be an excess of resistance in circuit, and the voltage of the main generator will tend to rise considerably above the desired value of voltage, while when the resistances are short-circuited either in whole or in part the voltage will tend to fall considerably below the desired value. Now, assuming the parts to be in the position as indicated in the drawing, in which the resistances are open-circuited, it will be seen that the voltage on the regulating magnet (38) will tend to increase above normal. The magnet will thus increase in strength and withdraw its armature, thereby separating contacts (41) and (42), and de-energizing the relay magnets. The armatures of these magnets will then be drawn back by their controlling springs and will thus close circuits about their respective resistances. The voltage of the main generator will then tend to fall and thereby weaken the magnet (38), whereupon the armature of the magnet moves away and closes the contacts (41) and (42). The relays then act to open the short-circuits about the resistances.

This operation is repeated with such rapidity that the voltage of the main generator has no time to vary appreciably from a constant value, and, as a matter of fact, it is found in practice that the vibrations of the regulator are so rapid as to maintain a practically constant voltage. The slight variations of voltage, to which the vibration of the regulator is due, are practically indistinguishable.

It is evident that the regulating magnet (38) which controls the regulating resistance may be connected to any portion of the system where it is desired to maintain constant potential. Thus it may be connected either at the generator terminals or it may be connected so as to be responsive to the voltage at some distant point of the system. However it be connected, it operates to maintain constant voltage at the point to which it is connected.



STEINMETZ'S SYSTEM OF VOLTAGE REGULATION.

TELEPHONE DISCRIMINATION ALLEGED.

The Independent telephone companies of Indiana are considerably exercised over the report of a general order on the part of the American Express Company to discontinue Independent telephone service in the state. There are in Indiana, it is said, 453 Independent telephone companies operating over 200,000 telephones, five times the number owned and operated by the Bell company, the service of which the American Express Company proposes to rely upon. Thus the discrimination is contended by the Independent companies to be unjust and unwise. The Independents say that no small part of the equipment of telephone companies is transported by express and that there is no law against telephone companies discriminating against the American Express Company in their patronage in a spirit of retaliation.

STREET RAILWAY CLUB AT PORTLAND.

The New England Street Railway Club, to the number of about 175 members and guests, was entertained at Portland, Me., on June 25th by the Portland Street Railway Company, whose general manager, Mr. Edward A. Newman, is a vice-president of the organization. Most of the members are from Boston and vicinity, and they made the trip to Portland by steamer from Boston. They were taken to Riverton, a pleasure resort managed by the electric railway company, in special cars, and breakfast was served. A harbor excursion, clambake and trip to Old Orchard rounded out the day, and the return to Boston was by steamer at night. Hon. Charles F. Libby, president of the Portland Railway Company, and the president of the Portland Board of Trade welcomed the guests.

RAILWAY TELEGRAPH SUPERINTENDENTS.

Montreal, Canada, was the scene of the twenty-seventh annual convention of the Association of Railway Telegraph Superintendents on June 24th to 27th. Headquarters were established at the Windsor Hotel. About 125 railroads were represented. At the first session addresses of welcome were made by the mayor and several aldermen of the city and responded to by the president, E. P. Griffith of the Erie Railroad, New York.

About 15 papers were read and discussed, among these being "Qualifying Operators for Train Dispatching," by C. S. Rhoads of Indianapolis; "Use of Telephones in Connection with Train Movements," by W. W. Ryder of Chicago; "Dry Batteries on Telegraph Circuits," by U. J. Fry of Milwaukee; "Moving Trains by Visible Signals," by L. B. Foley of New York.

A number of interesting exhibits of apparatus pertaining to telegraph and telephone work were made by the Western Electric Company, the Okonite Company, Sandwich (Ill.) Electric Company, Yetman Typewriter-transmitter Company, United States Electric Company, Stromberg-Carlson Telephone Manufacturing Company, Railroad Supply Company and a large number of representatives of these and other companies that are associate members of the association were actively present.

Entertainment features were not overlooked. Among these was a trip through the Lachine Rapids and an excursion to Quebec. The latter was arranged for by the Canadian Pacific Railway, and nearly all the members present attended it. The start was made on Friday night and Montreal was reached again on Saturday night. This trip proved to be probably the most enjoyable feature of the convention.

For the coming year new officers were chosen as follows: President, W. J. Camp of the Canadian Pacific Railway, Montreal; vice-president, G. W. Dailey of the Chicago and Northwestern Railway, Chicago; secretary and treasurer, P. W. Drew of the Wisconsin Central Railway, Chicago. Mr. Drew has been re-elected to this office for the twenty-seventh time.

COLLECTION OF SALTS ON INSULATED WIRE IN BASEMENT.

The accompanying illustration, reproduced from the annual report of the Wire Department of the city of Boston for 1907, shows a rather unusual state of affairs. It depicts the collection of salts

COLLECTION OF SALTS ON WIRE IN DAMP BASEMENT.

due to the deterioration of the insulation of wire as a result, undoubtedly, of the damp condition of the basement where the wire was placed. This particular basement was in the market district of Boston. The phenomenon resembles the efflorescence known as "creeping salts" on battery cells, but which is unusual on insulated wires.

COMBINED TELEPHONE LINE-SIGNAL AND SPRINGJACK.

A new form of combined line drop and springjack for telephone switchboards has been recently patented in the interests of the Western Electric Company. It is the invention of James L. McQuarrie of Chicago and consists of a signal adapted to be operated or displayed by an electromagnet, against a restoring force, such as gravity, a catch being arranged to maintain the signal in its posi-

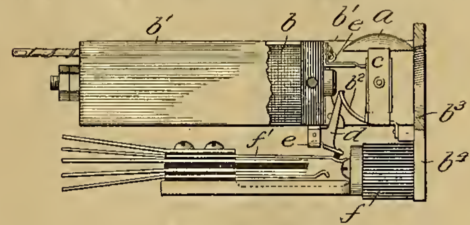


FIG. 1. COMBINED LINE DROP AND SPRINGJACK IN NORMAL POSITION.

tion of display. A springjack is associated with the annunciator, and provided with a line spring adapted, when flexed by the insertion of a plug, to operate the catch and release the signal, allowing it to return to its normal or concealed position.

Three drawings shown herewith illustrate the construction and operation of the device. Fig. 1 is a side elevation, with one side of the framework broken away, of such a combined annunciator and springjack, showing the signal or target concealed; Fig. 2 is a partial sectional view of the same, showing the signal displayed and locked in such position by the catch; and Fig. 3 is a similar view, but with the plug inserted to cause the line spring of the jack to operate the catch and release the signal.

The signal or target (a) is arranged to be operated by an electromagnet (b) and moved into a

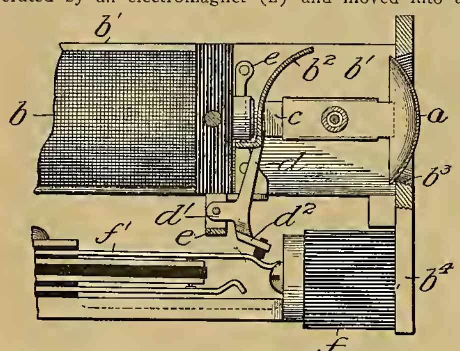


FIG. 2. COMBINED LINE DROP AND SPRINGJACK WITH SIGNAL DISPLAYED.

position of display against the restoring force. The signal may be carried at the upper end of a rocking arm (c), centrally pivoted in the arms of the U-shaped return pole piece (b') of the magnet, the arm carrying at its lower end a curved eccentric armature (b^2) in position to be attracted by the magnet pole to rock the arm against the restoring force of gravity and move the target into a position of display before the window (b^3) in the face plate (b^4) secured to the arms of the return pole piece.

A catch is arranged to maintain the signal in its position of display. This catch comprises a lever (d) having an angular arm (d') pivoted in a mounting (e) secured to one of the arms of the U-shaped pole piece. The lever is arranged to normally lie in the path of the curved armature, and is adapted to be forced back by it in its attractive movement, and to move by its own weight when the armature passes, so as to bring its free

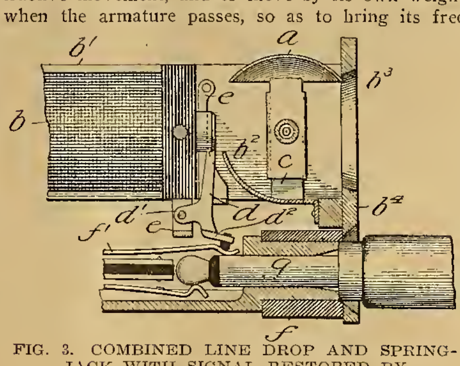


FIG. 3. COMBINED LINE DROP AND SPRINGJACK WITH SIGNAL RESTORED BY INSERTION OF PLUG.

end under the armature and to lock the same in its attracted position with the signal displayed.

A springjack (f) is secured to the face plate beneath the annunciator, and is provided with a line spring (f') adapted, when flexed by a plug (g) inserted in the jack, as shown in Fig. 3, to operate an angular foot (d^2) secured to lever (d), and thus move this lever to release the armature, allowing it and signal to return by gravity to their normal positions, concealing the signal. The plug and springjack form the regular connection switch for uniting an operators' plug circuit with a telephone line.

ELECTRICAL CONDITIONS IN OKLAHOMA CITY.

At Oklahoma City, Okla., current for both light and power is supplied by the Oklahoma Gas and Electric Company. A 550-volt direct-current circuit is operated for street-railway service, while there is a 2,300-volt, three-phase alternating system for both lighting and power. A power circuit of 220 volts, direct current, is also used, but no extensions are being made to this system, and it is the intention of the company eventually to discontinue this circuit. The series alternating street-lighting system is used, divided into five circuits and operated at a maximum potential of 7,000 volts.

The Oklahoma Street Railway Company is now erecting a power house north of the city and will generate all the power for operating its street-railway system. A three-phase, high-potential system, with a sub-station distribution, will be used. Rotary transformers will be used in changing the alternating current at 16,500 volts to direct current at 550 volts. The location and erection of the high-potential line will be in accordance with the recommendations of the city electrician, and the line will not be permitted to enter the city fire limits.

All wiring, both interior and exterior, is installed under the supervision of the city electrician. A general inspection of interior wiring in the mercantile and factory districts is made from time to time by the underwriters' inspection bureau, and where wiring is found to be in a seriously defective condition, a penalty is included in the fire-insurance rates until the defects are remedied. The National Electrical Code of 1905, without any modifications, is adopted in the present electrical ordinance. Authority is given the city electrician by the ordinance to make and enforce any additional rules and requirements he may deem necessary. Permits for the installation of wiring must be secured from the city electrician before the work is started. Applications for permits must be made in writing and accompanied by the required fee. The lighting company is prohibited from making any electrical connections to systems for which a certificate of approval has not been issued.

Power or lighting is not permitted from the grounded-trolley system excepting in power houses, sub-stations and car barns. All of the street-railway tracks are bonded by protected bonds, and no effects of electrolysis have been noticed on the water or gas piping.

Inside wiring is fair, new wiring being installed in accordance with the National Code. Some old wiring is in poor condition. All outside lines are overhead, with the exception of some telephone leads, which are underground in the business district. Transformers are located on poles, and the two-wire secondary distributing system is used. The lines in the congested district are badly crowded, having both the high-tension and low-tension mains close together. This condition will perhaps necessitate the placing of the lines underground at some future date.

CHICAGO SUBWAY TO BE HASTENED.

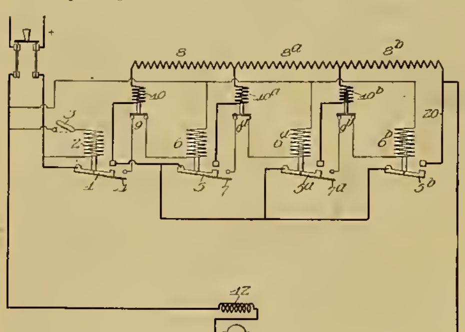
Preliminary steps toward the building of a street-railway subway in Chicago were taken last week when the local transportation committee of the Council authorized the chairman, Alderman Milton J. Foreman, to employ such experts and appoint such sub-committees as may be necessary properly to proceed with the work. It is the purpose of the committee to avoid such mistakes as were discovered in the New York, London and Paris subways. There are a number of important questions in connection with the subway that must be disposed of before actual work can be commenced. Sub-committees will be appointed to consider the water supply; sewerage carrying of gas and electric-light mains; and other matters will have to be disposed of even before the question of raising the money to build the subway is gone into.

A MOTOR STARTER SAID TO BE FOOL-PROOF.

Automatic control of a motor during starting has some marked advantages in that it insures proper cutting out of the starting resistances with even an unskilled operator and saves the time of the operator. To gain these advantages the starting controller must be reliable and "fool-proof." An invention aiming to secure these requirements has been perfected by Clark T. Henderson of Milwaukee, Wis. It was patented a few weeks ago and assigned to the Cutler-Hammer Manufacturing Company.

There are provided a series of electromagnetically operated switches, which control the starting resistance. These switches are equipped with auxiliary switches by means of which when one of the resistance switches is closed, it completes the circuit of a succeeding switch, and accordingly the switches are closed successively. The circuit of the operating winding of each switch is further controlled by means of an electromagnetically operated relay switch, there being an independent relay switch for each operating winding. The operating winding of each relay switch is connected in circuit in series between its preceding resistance switch and the motor armature. Accordingly, if one of the switches closes, the operating winding of the succeeding switch is connected in circuit, and if the current is abnormal, the relay switch will respond and prevent the next resistance switch from being closed. The operating winding of each relay switch is so connected in circuit that when its corresponding resistance switch is closed it is short-circuited, and thereby rendered inoperative, so that it cannot cause the switch to open.

The principle of this motor starter is made clear



AUTOMATIC-RELAY MOTOR STARTER.

by the accompanying diagram. The main switch (1) is operated by the electromagnet (2), the circuit of which is controlled by a hand switch (3) or other similar means. Resistance switches (5), (5^a) and (5^b) are likewise operated by electromagnets (6), (6^a) and (6^b), respectively. The main switch and switches (5) and (5^a) are provided with auxiliary contacts (4), (7) and (7^a), respectively. The resistance switches control resistance sections (8), (8^a) and (8^b) and have associated with them relay switches (9), (9^a) and (9^b) that are operated by the electromagnets (10), (10^a) and (10^b), respectively. Each of these is adapted to respond to a predetermined current. A series motor with armature (11) and field (12) is shown in the diagram, but the controller can be used with any type of motor using starting resistances.

In operation this motor starter is quite simple. Closing of the hand switch (3) energizes the magnet (2) and closes the main switch (1). This starts the motor with all resistances in circuit. Closing of the main switch also connects winding (6) across the line through auxiliary contact (4) and relay switch (9). Accordingly it will respond and close resistance switch (5) which will short-circuit resistance (8) and winding (10) and connect relay winding (10^a) in circuit.

However, the resistance switch (5) will not be closed if the current in the motor circuit is abnormal, as the circuit of the winding (6) will be opened by the relay switch (9), this being opened by the relay winding (10) which is in series with the motor and adapted to respond to a predetermined current. As soon as the motor current subsides to a normal amount, relay switch (9) will close, and then winding (6) will be energized and resistance switch (5) will be closed.

If the current becomes abnormal after resistance section (8) is removed from circuit by resistance switch (5), the relay winding (10^a) will respond and open relay switch (9^a), thus opening the circuit of winding (6^a). As soon as the current becomes normal the relay switch (9^a) will be closed and then winding (6^a) will be connected across line. When switch (5^a) is closed relay winding (10^b) is connected in series with the motor armature and resistance (8^b) and the relay winding (10^a) are short-circuited. If the current be abnormal the same action will take place as described above and keep switch (5^b) from closing till the proper time. When this switch is closed the motor is connected directly across line and all the resistances are short-circuited. Any number of resistance sections may be used, although only three are shown.

The resistance switches thus operate successively to remove the starting resistance from circuit step by step. If the current becomes abnormal at any stage in the process, the closure of the switch next in order of operation would be arrested by its corresponding relay switch.

Inasmuch as each switch, when it is closed, short-circuits its corresponding relay switch, it is rendered independent of any subsequent abnormal increase in current, and accordingly the switches that have been closed will not be opened, and the switch next in order of operation will be prevented from closing, inasmuch as the circuit to its corresponding relay winding is closed by the switch that has preceded in operation.

ELECTRICAL ENGINEERS OF THE STEEL INDUSTRY.

The first annual convention of the Association of Iron and Steel Electrical Engineers was held at the home of the Engineers' Club in Philadelphia on June 24th, 25th and 26th. The membership of this new organization is 33, of whom 13 attended the first meeting. An address by the president, James Farrington of the La Belle Iron Works, Steubenville, Ohio, opened the technical programme. This was followed by a report on the operation of the Stoeckel induction drive, by the secretary, G. H. Winslow of the National Tube Company, Pittsburg, and papers on "Electric Drilling and Reaming," by F. W. Stevens; "Electric Motors for Heavy Torque and Rapid Reversal," by G. H. Richardson, and "The Induction Drive," by A. P. Stoeckel.

At the meeting on the second day papers were read by H. D. James, B. Wiley, C. T. Henderson, B. A. Behrend, H. F. Stratton, R. C. Hull, D. B. Rushmore, G. Dunn and C. J. Toerring. The Crocker-Wheeler Company acted as host for the visitors at a noonday luncheon at the Hotel Walton, and they were guests of the Westinghouse Electric and Manufacturing Company for dinner at Willow Grove.

On the last day of the convention the attending members made a number of inspection trips to various plants in the neighborhood of Philadelphia, including those of the Midvale Steel Company, the American Bridge Company, at Pencoyd, the Electrical Storage Battery Company, at Tioga, and the New York Shipbuilding Company, at South Camden. The visitors were entertained at luncheon by the officers of the Electric Storage Battery Company. The first convention was declared to be a great success from every point of view.

INDIANAPOLIS TELEPHONE SITUATION.

After some months of labor the committee appointed by the Civic Association of Indianapolis, co-operating with the Board of Public Works to investigate the telephone situation with reference to a new franchise for the Indianapolis and New Telephone companies, has filed its report, recommending that new franchises be granted with an increase of the rates, though not to the extent asked for by the companies. The report suggests that for individual business telephones $48 per annum be charged instead of $54 as asked, and that for a two-party business telephone $36 be charged instead of $40 as asked. Other rates recommended are: For individual residence telephones, $28 instead of $32; for two-party lines, $22 instead of $26, and for four-party lines, $18 instead of $22. The committee recommends that the new franchise provide for a readjustment of these rates from time to time. The committee advises a consolidation of the Independent and Central Union companies if possible. As soon as the new franchise is granted the New Telephone Company will enter upon the work of improving its plant on a promise of an expenditure of more than $200,000.

NOVEL GERMAN ELECTRIC HOISTING BLOCKS.

By Frank C. Perkins.

Machine shops, foundries and other manufacturing establishments have until recently been equipped

FIG. 1. ELECTRIC HOISTING BLOCK CAPABLE OF LIFTING 2,000 KILOGRAMS.

with pulley blocks for raising weights of from less than one ton up to five tons, operated either by hand or by compressed air. Electrically driven pulley blocks are now being constructed in America as well as in Europe of practical design, although the first constructions were not only too complicated and too heavy, but the over-all height was in many cases nearly twice as great as in the case of hand-operated pulley blocks.

The design and construction as well as the method of operation of some interesting types of German electric pulley blocks are shown in the accompanying illustrations, which show blocks made in Bremen, and designed by Alfred Gese.

A motor is attached to the side of the block

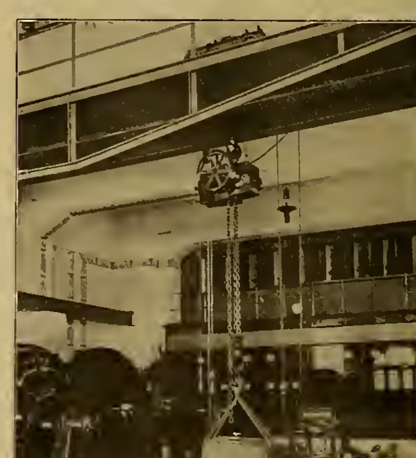


FIG. 2. DIRECT-CURRENT HOISTING BLOCK IN USE IN CENRAL STATION.

with the top hook in the position shown in Fig. 1, which shows an electric pulley block of 2,000 kilograms capacity. It will be noted that this design is compact. It is said to be very strong, with an over-all height which does not exceed that for an ordinary hand-operated pulley block for the same capacity.

A cast-steel motor casing is used which, as will be noted, is combined with the block from which the weight hook is suspended. In order to obtain a proper balance the resistance or starter is attached to the opposite side of the block, and, whether the device has a load or not, the apparatus is horizontal at all times.

As the distance between shaft centers of the round type of motor is comparatively large, gear wheels with large diameters are required, and are much in the way, but by inserting a special rawhide pinion supported in a ring-lubricated bearing, this difficulty has been overcome. It is maintained that the size of the gear wheel can be smaller therefore and the shaft centers come closer together than with two gear wheels only, as indicated in Fig. 1.

A round type of motor with intermediate pinion is shown in the accompanying illustration (Fig. 4) at work in a German plant, and one of the leads may be clearly seen as passed over pulleys and provided with a counterweight.

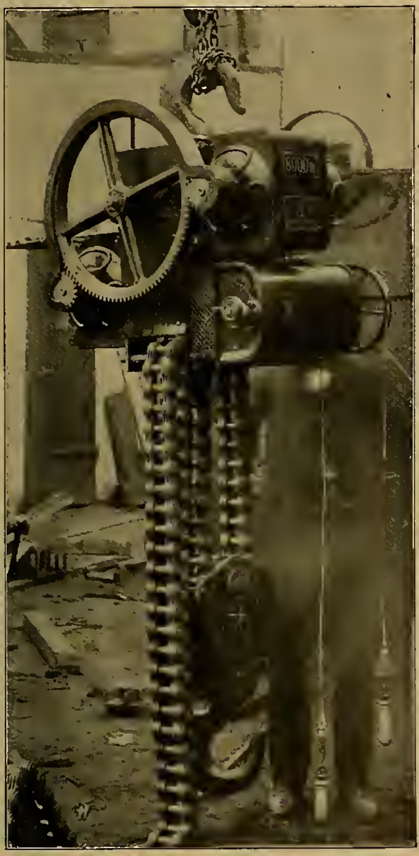


FIG. 3. TWO-MOTOR ELECTRIC HOISTING BLOCK OF 8,000 KILOGRAMS' LIFTING CAPACITY.

While the round type of motor can be used for direct current, as well as for three-phase alternating current, a special design hoisting block has been adopted for use with direct current. This device is of square shape and of narrow construction. It is held that the distance between the shaft centers is reduced in this construction so that the intermediate pinion is not found necessary. One of these direct-current electric pulley blocks of 3,000 kilograms capacity is shown in operation in a German electric plant in the accompanying illustration (Fig. 2).

When a greater maximum lifting capacity than 5,000 kilograms is required, the weight of a single motor would be too great, and the pulley blocks would therefore be one-sided for this reason, unless heavy weights were added to balance it. Two motors are therefore provided for electric hoists of large capacity, one being placed on each side of the pulley, and the two connected in series, both engaging with the gear wheel on the worm-wheel shaft.

Fig. 3 shows one of these German two-motor pulley blocks of 8,000 kilograms capacity with an over-all height practically the same as for pulley blocks of the same capacity operated by hand. These large electric hoists are handled with controllers provided with brake steps and arranged with handles which return automatically to the "off" position.

It is declared that these German electric hoisting devices have been found economical and thoroughly practical. Heretofore the compressed-air pulley block has been the only mechanical power device competing with the hand-driven apparatus to any great extent, and the maintenance of the pneumatic hoists is said to be very much greater than that of the electric device.

SUPPLYING POWER FOR BUILDING THE LOS ANGELES AQUEDUCT.

Probably no greater feat of hydraulic engineering has been attempted in this country than the project undertaken, scarcely a year ago, to secure for the city of Los Angeles, Cal., a water supply from the snow-fed Owens River and its tributaries by means of a 215-mile aqueduct which will bring 400 cubic feet of pure snow-water per second into the city.

In building a work of such magnitude, it necessarily follows that the question of adequate and cheap power to use in excavating, to drive the tunnels and to hoist material up steep mountain sides was of prime importance; but the large expense of power generated by steam at practically all parts of the line seemed to be a serious difficulty to overcome.

These considerations very early suggested the advisability of using electricity as the motive power. Current is to be furnished eventually from hydro-electric plants built along the line of the aqueduct, the output of which can be used wherever needed to drive the construction plant. But the chief source of electrical energy from the first will be the mains of the Los Angeles Edison Company, whose high-voltage transmission lines extend to the city of Los Angeles from the Kern River hydro-electric plant, owned and operated by the company. Ample power will thus be obtained for the entire project, and this power can be delivered over transmission lines so readily that no other method of supplying power would be comparable in cost and convenience.

In many respects the Kern River development is unique. It is said to be the largest hydro-electric plant west of Niagara. The transmission line of 117 miles is one of the longest in the world. The pressure of 75,000 volts over such a length of cable is among the highest ever attempted. The conduit which leads to the pressure main is the longest underground tunnel system in use for this purpose. The concrete-encased penstock, from which the supply will come, tapering so as to accelerate the force of the water at the power house, is said to be the first of its kind ever placed in service.

The four waterwheels which convert hydraulic to electrical energy were built by Allis-Chalmers Company of Milwaukee, and have each a capacity of 10,750 horsepower at full nozzle opening and a speed of 250 revolutions per minute, when operating under a net effective head of 865 feet. In addition to the main turbines, there are two exciter turbines, each with a capacity of 450 horsepower and a speed of 430 revolutions per minute.

The Kern River installation of the Edison company is but one of three waterpower developments owned by this company, in addition to six or seven steam plants, located within a radius of 200 miles, all of which will operate in synchronism. A portion of the output of this plant is disposed of along the line to Los Angeles. A very considerable amount of power will be utilized in the city of Santa Barbara. The demand for power in Los Angeles, Santa Barbara and San Luis Obispo counties far exceeds the supply, and the output from this station helps to satisfy the general requirements rather than being devoted to any specific purpose. The Edison company contemplates the building of plants Nos. 2, 3 and 4 on the Kern River, which will aggregate over 100,000 horsepower, in addition to the output of the present station.

UNUSUAL ACCIDENT IN WATERPOWER PLANT.

According to the reports given out, the accident which occurred in the Cazadero hydro-electric plant of the Portland Railway, Light and Power Company on June 21st was one of the most singular on record. It is said that an automatic governor connected with one of the large waterwheels got out of order and prevented the closing of the gate which supplied the waterpower. As a result the waterwheel ran away and the centrifugal force finally caused the armature of the machine to fly to pieces. Then a piece of flying metal struck and disabled the governor controlling a second generating unit. The second generator flew to pieces, and, in like manner, caused the destruction of a third generator. It is also stated that a portion of one of the machines which had become excessively heated dropped on the wooden floor of the building and caused a fire which burned out the interior of the structure, completing the destruction. The total loss is estimated at $110,000. The plant is located in Clackamas County, Oregon.

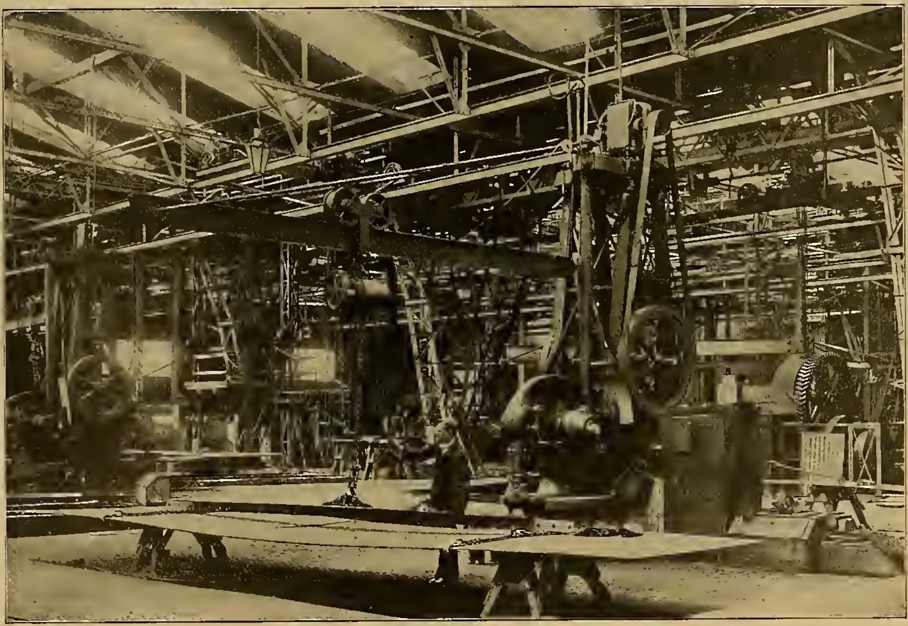


FIG. 4. ELECTRIC HOISTING BLOCK IN GERMAN MACHINE SHOP.

ENGINEERS' SOCIETY OF MILWAUKEE.

At its annual meeting on June 17th the Engineers' Society of Milwaukee elected the following-named officers: President, E. P. Worden; vice-president, T. S. Watson; treasurer, M. A. Beck; secretary, W. F. Martin; directors to serve for three years, L. L. Tatum, H. Weickel and Paul Johnson. Mr. Knox, the retiring president, addressed the society on "Excavating Machinery," and his paper was illustrated by lantern-slide pictures. Secretary Martin reports that the society has had a successful year and now has a membership of 122.

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO
TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York
Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

THE ACTION taken by the American Institute of Electrical Engineers, the American Gas Institute, the National Electric Light Association and the Illuminating Engineering Society in relation to a common unit of candlepower is of considerable importance. It is expected that ultimately there may be international agreement on a common unit of luminous intensity to be used throughout the world. In the meantime it is recommended that a common candle unit be used which shall be two per cent. less than that now maintained at the Washington Bureau of Standards. Such similar foreign societies as may be interested are to be supplied with a statement of the movement in the United States toward a common international candle unit and requested to co-operate in the work.

AS IS POINTED out by Mr. William H. Bryan of St. Louis in a paper presented at the recent Detroit meeting of the American Society of Civil Engineers, the number, extent and variety of pipe lines in modern power plants have become so great as to lead to confusion, resulting in uncertainty, delay and occasional accident. A beginning has been made toward the quick identification of such lines by coloring them, further subdivision being secured by giving the flanges a different tint. The value of some such plan in emergencies, and to supervising engineers and inspectors, is evident. Mr. Bryan gave several chromatic schemes already in use. He believes that the time is ripe for concerted action looking to the establishment of a uniform, standard and widely applicable color scheme for this purpose, and his suggestion is worthy of careful attention.

LAST WEEK we gave the readers of the Western Electrician an idea of the remarkable results which have been achieved by the Commonwealth Edison Company of Chicago in the way of selling electric power to large users at wholesale rates. It is gratifying to note that this subject is receiving attention abroad as well as at home. Mr. John F. C. Snell, in a paper entitled "Cost of Electric Power for Industrial Purposes," read a short time ago before the (British) Institution of Electrical Engineers, had this to say:

"There is an enormous scope in this country for electrical applications among all classes of works. In the preparation of particulars for the recent London County Council power bills, the author and his colleagues ascertained that in the area of Greater London alone there are factories utilizing altogether some 400,000 horsepower, while in the evidence brought forward in support of the Administrative Company's bill, 1906, this figure was given as 535,742 horsepower, of which only 29,053 horsepower was then supplied from electrical undertakings. In most of these it would obviously pay the consumer and be in the interest of London and of the nation that these works should be electrified. In course of time this is bound to be. If Greater London were cleared of factory chimneys, coal dust and ash wagons, and if mechanically propelled vehicles replaced horse vehicles, there would result an enormous change for the better in the physical conditions of life. Moreover, a cheap supply of power would assist to prevent the migration of power users and the consequent reduction in ratable value—a factor which reacts unfavorably on the remaining inhabitants."

It may be added that both in the United States and in foreign countries merely a beginning has been made in the matter of applying electric power to big undertakings. Those who supply electricity should have as their ambition the turning of every wheel to which power is applied

---

WHETHER DISEASE can be communicated by germs lodged in telephone mouthpieces is a question that has caused considerable discussion. These mouthpieces are of hard rubber and would seem to be unfavorable to germ culture. Millions of conversations are carried on over the telephone daily, and who can say that in any specific case disease has been spread thereby? On the other hand, it is possible that contagion might be carried in this way without the cause being known.

The subject has attracted renewed attention in England of late by the report of a test made public by the London Lancet. One of the Postoffice public telephone mouthpieces was wiped around with a swab to remove any existing germs in the mouthpiece, and the contents of the swab used to inoculate two guinea pigs. One guinea pig was killed 23 days after inoculation, and a post-mortem examination showed pronounced signs of tuberculosis. The second guinea pig was killed 27 days after inoculation and showed similar signs of infection, thus proving, it is declared, that the germs of tuberculosis can be transmitted by the public telephone as at present in general use.

It is contended that this proves conclusively that all telephones, whether in public or private use, need to be periodically disinfected, as is the case on the London Stock Exchange, where the 50 telephones are sprayed daily with a disinfectant under an agreement with the General Postoffice. However, the experiment, accepting the report as correct, is not altogether satisfactory. What would have happened to the guinea pigs if the swab had been applied to a window-pane facing a public street? Are not the germs of tuberculosis and other diseases all about us in crowded cities? Is there not a constant warfare in the human body between disease germs and some antitoxic principle in the white corpuscles of the blood? Perhaps the telephone is no worse than the air of an assembly hall thronged with people.

Practical telephone men will be apt to think that physicians are unduly alarmed. Nevertheless, it will do no harm, and may add to one's peace of mind, to sponge the telephone mouthpiece daily with some mild antiseptic solution.

A SENSIBLE WORD in relation to the teaching of physics in high schools is uttered by Professor Pyle of the Morris High School of New York in a recent paper. He lays stress on the practical value of physics and maintains that it is more valuable from the viewpoint of intelligent citizenship for the average boy and girl in a high school to understand refraction of light in a qualitative way, and be able to explain the rainbow, its circular shape, and the order of its colors, the illuminating of dark basements by pavements composed of glass prisms, the use of lenses for near sight and old sight, the accommodation of the lens of the eye, and the common optical instruments than it is to be able to do such things as define index of refraction, describe a method of determining it, and tell where errors are most likely to creep in. He says that we are influenced too much by the colleges, and we are doing too little to make physics of practical value to the great majority who will never go to college. "It is a disgrace, for instance, the way we slight electricity. Considering the age in which we live, it deserves twice the time at least. Year after year pupils come to us eagerly looking forward to the electrical applications, only to quit physics sorely disappointed. Physics as taught today is a fine example of a subject taking precedence over the claims of pupils."

Mr. Pyle does not advocate the teaching of technical or engineering physics in high school but rather a study of the common applications that illustrate the principles which the student is, or should be, striving to grasp. The author, however, carries a good idea to rather an extreme position. "Nothing," he says, "should be retained in the physics course solely on the ground of mental discipline. If a topic is of no practical use or of small practical use, and at the same time does not furnish information that an intelligent citizen should possess, let us cut it entirely out of our teaching." This is going too far, perhaps, even for the physics course in high school. Who can tell what principle of physics may be neglected as of no practical use in view of the advancement in the useful arts that may be witnessed 20 years from today? Better teach thoroughly the fundamental principles of the science, as they are known, with the addition of plenty of the practical applications on which Mr. Pyle rightly places so much emphasis.

FIRST ELECTRIC STREET CARS IN WARSAW.

The first electric street railway in Warsaw, Russia, was started in operation in April. The electric line succeeds horse-drawn cars introduced in 1881 by a Belgian company, which in 1889 sold it to the city for an annual payment of $175,000 until the expiration of the concession, in 1916. Operating 304 cars and charging passengers seven kopecks (3.6 cents) first class and five kopecks (2.5 cents) second class for not exceeding two miles, a gross revenue of $839,052 was secured in 1907. The daily hours are from 7 a. m. to 11:30 p. m., with intervals for meals, for which drivers receive 62 to 67 cents; conductors, 62 to 83 cents. Inspectors receive $30.90 to $41.20 a month.

The reconstruction work was carried on through a building committee appointed by the emperor. The principal private contractors were German electric companies. There will be 180 motor cars, while the power house has three turbine generators of 1,800 horsepower each.

The system will be managed by a syndicate which has closed a contract with the city until 1922. The syndicate agrees to pay the city an annual sum of 402,000 rubles ($207,030) and 5½ per cent. on the invested capital of about 7,000,000 rubles ($3,605,000). Out of these receipts the city will continue the payment of 350,000 rubles per annum to the Belgian company up to the year 1916. After the expiration of this liability the income passes into the city treasury. Whatever surplus net profit remains after payment to the city of the sums agreed upon is to be divided into equal parts between the city and the syndicate.

AMERICAN STREET-RAILWAY MEETING TO BE HELD AT ATLANTIC CITY.

The next annual convention of the American Street and Interurban Railway Association will be held October 12th to 16th, inclusive, at Atlantic City. The days on which the auxiliary associations of the accountants, engineers, claim agents and manufacturers, and the transportation and traffic associations will hold their separate meetings have not yet been definitely decided upon, but this matter will be settled soon. Atlantic City was chosen by the executive committee after considerable deliberation between its advantages and those of the two competing cities, Washington and Denver.

Hotel and other accommodations of the winning city are well known, as it was the scene of last year's convention. The exhibit of the manufacturers will be located on Young's "Million Dollar" Pier. This is always a very important feature of the national street-railway conventions, and it is expected that a display even more attractive than that of last year will be given.

WESTINGHOUSE READJUSTMENT.

The plan of the merchandise creditors' committee (of which Joseph W. Marsh of Pittsburg is chairman) for adjusting the recent financial difficulty of the Westinghouse Electric and Manufacturing Company is entirely satisfactory to all concerned, and it is understood that at a meeting of the readjustment committee on June 26th arrangements were made to extend the time for putting the plan into effect to September 1st. This will give the time necessary to complete details and secure the small remaining amount of subscriptions to the new stock issue proposed by the merchandise creditors' plan.

BOSTON'S ELECTRICAL PLANTS.

The following table, from the annual report of the Wire Department of the city of Boston, gives interesting statistics of the electrical plants of the city of Boston on January 31, 1908:

	Total Rated Horse-power of Boilers.	Total Rated Horse-power of Engines	Capacity in Incandescent Lamps.	Capacity in Arc Lamps.	Number of Motors.	Horse-power of Motors.	Number of Stations.
Boston Elevated Railway Co	39,138	64,950	66,149	625	5,401	226,607	10
Edison Electric Illuminating Co	25,456	71,200	749,087	9,169	9,200	35,953	13
Charlestown Gas and Electric Light Co	475	140	......	......	80	503	......
Boston Consolidated Gas Co	1,500	3,100	96,170	604	121	486	1
Block Plant Electric Light Co	273	417	5,250	......	3	16	1
Sudbury Building	202	230	656	......	30	140	1
Steam and Power Co	267	295	4,000	400	60	294	2
Hecht Building Plant	300	200	2,400	240	32	234	1
*Isolated Plants	64,859	44,471	223,000	3,869	1,472	11,428	301
Totals	132,470	185,003	1,146,712	14 907	16,399	275,661	330

*The capacity of generators for isolated plants in kilowatts, 22,251.

"MECHANICALS" IN DETROIT.

The spring meeting of the American Society of Mechanical Engineers was held in the Hotel Cadillac, Detroit, June 23d to 26th. The members were welcomed by Mayor Thompson, who paid a glowing tribute to the work of the engineer. The response was made by President M. L. Holman.

On Wednesday, June 24th, the papers on "Hoisting and Conveying Machinery," "The Continuous Conveying of Materials," "The Belt Conveyor," and "Conveying Machinery in the Portland Cement Plant" were presented.

In the afternoon the papers on "The Thermal Properties of Superheated Steam," "A Rational Method of Checking Conical Pistons for Stress," "A Journal Friction-measuring Machine," "The Surge Tank in Waterpower Plants," "Some Pitot Tube Studies," "Comparison of Screw Thread Standards," and "Identification of Power House Piping by Colors" were read.

In the Gas Power Section on Thursday afternoon there were papers on "The By-product Coke Oven," "Power Plant Operation on Producer Gas," "Horsepower Friction Losses and Efficiencies of Gas and Oil Engines," and "A Simple Method of Cleaning Gas Conduits."

At the concluding session on Friday morning the paper on "Economy Tests of High-speed Engines" was read.

The meetings of the Society of Automobile Engineers and the Society for the Promotion of Engineering Education were held on the same dates, and the sessions were arranged so that they did not conflict.

Numerous plants were visited, among them being the Detroit Edison company's turbine station, the Ford Automobile Company, the Packard Automobile Company, the Burroughs Adding Machine Company, and what was probably the most enjoyable, the Great Lakes Engineering Company, where the launching of a 10,000-ton freighter 550 feet long took place. This trip was made on the steamer Pleasure, chartered for the occasion, and was enjoyed by the ladies as well as by the men.

Among the social features were a ball and car rides and a luncheon at the head of Belle Isle. The trip was made in automobiles and a canoe trip was enjoyed in the lagoons of the island.

The attendance was large, there being nearly 600 registered.

EXCITEMENT IN ENGLEWATER.

The grill room of the Automobile Club was hardly large enough to hold all the members of the Electric Club of Chicago who attended the smoker of Friday evening of last week. The feature of the evening was the burlesque sale of a municipal plant to the town of Englewater. On a platform at one side of the room sat the city officials, and the salesmen appeared before them after the bids had been opened and spoke their pieces. A bar was thoughtfully provided at one end of the platform. Many of the performers were in costume, and the whole affair was highly amusing. Those taking part were:

Mayor—E. F. Kirkpatrick.

City Clerk—O. B. Duncan.

Consulting Engineer—W. S. Taussig.

Councilmen—F. J. Alderson, A. D. Blocker, C. S. Boggs, Arthur Frantzen, D. H. Howard, A. L. Millard, John J. Schayer, R. M. Van Vleet.

Salesmen—Perry R. Boole, J. R. Dean, F. N. Henkel, C. A. S. Howlett, W. A. Kreider, E. H. Nagelstock, H. E. Niesz, Frank L. Perry, Francis Raymond.

In addition there was singing by Mr. Sturm and Miss McNally and a monologue by Ed McCuen, the comedian. Rrefreshments, pipes and tobacco were provided in abundance, and the evening passed pleasantly.

RARE-EARTH MINERALS IN TEXAS.

In the middle of the "Llano region," an "island" of pre-Cambrian rocks in almost the geographical center of Texas, stands one of the most remarkable natural mounds in the United States. This mound is known as Baringer Hill, and is celebrated for its content of what geologists term "rare-earth metal minerals." In a short description of this hill, which is formed by a dike and is only about 40 feet high and 100 by about 200 feet in lateral extent, F. L. Hess of the United States Geological Survey, in a report just published (which may be had on application to the Survey at Washington, D. C.), gives a list of about two dozen minerals found in this small area, among them a number of radio-active materials and others of great and increasing practical importance. Among the rare-earth minerals at Baringer Hill are fergusonite, gadolinite, polycrase, yttrialite and cyrtolite.

The economic interest in these minerals is due to the incandescence of their oxides on being heated. This property makes them available for use as glowers in gas and electric lamps. Thoria, beryllia, yttria and zirconia are the most useful minerals employed for this purpose. Until the discovery of the deposits at Baringer Hill it was practically impossible to get sufficient yttria-bearing minerals to manufacture glowers for electric lamps; but fergusonite and gadolinite, with lesser amounts of cyrtolite and other minerals containing yttria, occur here in quantities large enough to meet the demand. The Nernst Lamp Company owns this valuable deposit, but its needs require only the occasional working of the mine.

SURGE TANK IN WATERPOWER PLANTS.

R. D. Johnson of Albany, N. Y., read a paper on this subject at the recent Detroit meeting of the American Society of Mechanical Engineers. His paper treated of the momentum of flowing water in long pressure pipes for the supply of hydraulic turbines or impulse wheels and of the control of rate of flow by modifying the momentum in such manner as to obviate harmful effect upon speed regulation of the waterwheels, without waste of water through relief valves, deflecting nozzles or by-passing it, as has usually been thought unavoidable where pipes are long, velocity great and pressures high.

This is accomplished by a surge tank near the down stream end of the pressure pipe, atmospheric or under compressed air.

The author discussed the size of surge tank needed under various conditions of velocity, size and length of the moving water column, and presented a novel device by which the diameter (or area) of the tank may be reduced about one-half, thereby lessening its cost and at the same time improving the pressure regulation for speed control. This device is called the "differential regulator" and it may work open to the air or under compressed air where head is high and support lacking.

INDIANA MUNICIPAL LEAGUE.

The Municipal League of Indiana held its eighth annual meeting in Laporte on June 23d to 25th. About 200 delegates, consisting of mayors, aldermen, engineers and others were present. One of the principal topics for discussion was municipal ownership of electric light and gas plants. The discussion was opened by the reading of a paper by Mayor Shilling of Richmond. He took strong grounds in favor of cities owning their utilities and cited as an example the city of Richmond, Ind., which has a municipal electric lighting plant, which the mayor says is being operated successfully. He believed that a successful administration of this branch of the public service demonstrated that other utilities could likewise be operated. A number of delegates present took issue with Mayor Shilling and cited instances where municipal ownership had proved an absolute failure and an expensive experiment. It was declared that a number of cities in Indiana conducting municipal plants are searching with diligence for some private corporation to take over the plants and relieve the cities of their burdens.

MR. MARCONI ON TRANSATLANTIC RADIO-TELEGRAPHY.[1]

The popular, as well as scientific, interest which is being taken in the problem of transatlantic wireless telegraphy was well exemplified at the Royal Institution on Friday last. Both the body and gallery of the theater were filled to their utmost capacity some time before the appointed hour. The lecture was quite uncontroversial, and disputed topics were scarcely touched upon. The subject matter of Mr. Marconi's lecture was, in general, historical. Having read a wireless telegram from Sir William Crookes, requesting him to lecture at the Royal Institution, and his own wireless reply, he dealt with the first attempts at oversea wireless telegraphy, in March, 1899, when communication was established between England and France.

The difficulties then foreseen were those due to the curvature of the earth, and the interference likely to be caused by powerful radiators to stations or ships within their sphere of influence. These drawbacks were, however, found to be imaginary, or easily surmountable, while other difficulties cropped up in their places. Some tests undertaken between St. Catherine's Point and the Lizard, a distance of 186 miles, showed that the curvature was a negligible quantity, while by means of tuning devices, interference between stations was in a great degree prevented. The energy employed to signal over this distance could be brought as low as 150 watts, or less, if a higher and larger aerial were used. The success of these tests led to the erection of the stations at Poldhu, Cornwall, and at Cape Cod, in America, as, notwithsanding the high cost of the stations, it is more profitable to transmit messages at 6d. a word to America than at, say, ½d. a word across the Channel, the economical advantage of "wireless" over cable and land lines increasing instead of diminishing with the distance.

The plant used at Poldhu consisted of an alternator having an output of 25 kilowatts, which charged a condenser, having a glass dielectric of great strength, through suitable transformers. The form of aerial first proposed consisted of a conical arrangement of wires insulated at the top and gathered together at a lower point in the form of a funnel. This aerial was supported by a ring of 20 masts, each 200 feet high, arranged in a circle of 200 feet diameter. As regards circuits, a modification proposed by Professor Fleming was employed. In this arrangement, in place of one high-frequency oscillation circuit, two were employed, and the constants of the two circuits were so arranged that very high-tension discharges could be obtained from one of the circuits—the one which was inductively connected with the aerial—without danger of damage to the generator circuits.

The transmitting conductor at Poldhu consisted of 50 almost vertical copper wires supported at the top by a horizontal wire stretched between two masts 160 feet high and 220 feet apart. These wires converged together at the lower end in the shape of a large fan and were connected to the instruments. The transmitting condenser used had a capacity of 0.02 microfarad, and was charged to a potential sufficient to produce a suitable spark between spheres three inches in diameter, 1½ inches apart, the wave length being 1,200 feet. The actual power employed for wave production was about 15 kilowatts.

The want of a suitable receiving station in Newfoundland led to the use of kites for supporting the aerials, while, owing to their consequent constant variations in capacity with altitude, various microphonic self-restoring coherers, placed either directly in the aerial or in the secondary circuit of an oscillation transformer, were employed. By means of this apparatus wireless communication was first established across the Atlantic, though its primary object was to ascertain the possibility of detecting the effects of electric waves over a distance of 2,000 miles. Further tests carried out between Poldhu and the American liner Philadelphia showed that readable messages could be received up to 1,551 miles, while S's and other test letters were obtained at a distance of 2,099 miles. These facts were recapitulated by the lecturer to dispel the effects of suggestions throwing doubt on the authenticity of these signals, and attributing them to atmospheric disturbances.

A result of some scientific interest, which was noticed during these tests, was the effect of sunlight on the propagation of waves over great distances. The lecturer is inclined to believe this is due to the ionization of the gaseous molecules of the air effected by ultra-violet light, and as the ultra-violet rays which emanate from the sun are largely absorbed in the upper atmosphere of the earth, it is probable that that portion of the earth's atmosphere which is facing the sun will contain more ions or electrons than that portion which is in darkness, and therefore, as Prof. J. J. Thomson has shown, this illuminated and ionized air will absorb some of the energy of the electric waves. Apparently the amplitude of the electrical oscillations and the wave lengths radiated have much to do with this interesting phenomenon, small amplitudes and long waves being subject to the effect of daylight to a less degree than large amplitudes and short waves.

The erection of a wireless station in Newfoundland having been opposed by an existing cable company, the building of a station at Glace Bay, in Canada, was begun, and at the same time, alterations were taken in hand at Poldhu. The towers were extended and additional machinery was installed. In most of the experiments carried out from Poldhu the capacity of the sending condenser was one-thirtieth microfarad, the spark length 1¾ inches, and the wave length 3,600 feet. During the time that the station at Glace Bay was being built tests were carried out betwen Poldhu and the Italian cruiser Carlo Alberto, which showed that, when using waves of over 1,000 meters in length, the intervening land or mountains did not bring about any considerable reduction in the distance over which it is possible to communicate.

In December, 1902, complimentary messages were sent from Glace Bay, and shortly afterward from Cape Cod, to Poldhu, the energy in the latter case being 10 kilowatts. A press service was also attempted, but a breakdown in the apparatus caused it to be suspended after a short time.

As the numerous improvements then available could not be conveniently applied to the existing plants at Poldhu and Cape Breton, the erection of a large station in Ireland was begun, and the one at Glace Bay was moved to a more convenient place. In the meantime successful communication was established between various shore and ship stations, notably Gibraltar and H. M. S. Duncan, and with a wave length of 14,000 feet it was found possible to telegraph over a distance of 500 miles by using one kilowatt.

The station at Glace Bay commenced operations in 1905. Its natural wave length was 12,000 feet, the capacity employed was 1.8 microfarads, and the spark length three-fourths inch. At the transatlantic stations the directional aerial was adopted, as the ordinary method of sending out radiations in all directions was often a disadvantage. To limit the direction of radiation has been the endeavor of many workers, including Artom, Braun and Bellini and Tosi, and the lecturer, after making tests with copper mirrors, now uses horizontal antennæ disposed in a particular manner for this purpose. When this type of aerial was adopted at Glace Bay a considerable strengthening of the signals received at Poldhu was noticed, and it was thereupon decided to adopt this type of aerial at all long-distance stations controlled by the Marconi company. A further improvement adopted at Clifden and Glace Bay was the employment of air condensers, thus reducing the losses due to dielectric hysteresis and breakages in the dielectric. The station was opened at the end of May, 1907, and experiments with Glace Bay were then begun.

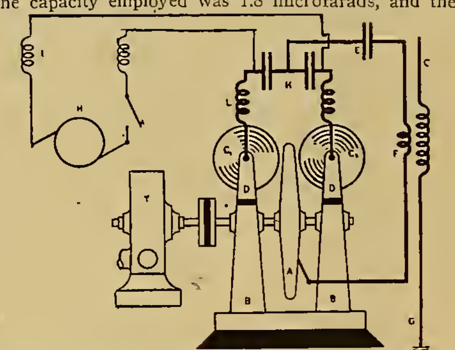


DIAGRAM OF MARCONI'S PERSISTENT-WAVE APPARATUS.

The wave length used during these tests was 12,000 feet, the capacity 1.6 microfarads, and the potential to which the condenser was charged 80,000 volts. A diagram of the arrangement used at this station is given herewith. By the use of this device continuous, or very nearly continuous, oscillations are produced. A metal disk (A), insulated from earth, is caused to rotate at a very high speed by means of a high-speed electric motor or steam turbine. Adjacent to this disk (the middle disk) are two others (C_1) and (C_2), which are called the polar disks, and are also capable of rotation at high speeds. These polar disks should have their peripheries very close to the surface or edges of the middle disk. If a small amount of energy is used, stationary knobs or points may be used in place of the side disks. The two polar disks are connected respectively through suitable brushes to the outer ends or terminals of the two condensers (K), joined in series and connected through suitable inductive resistances to the terminals of a generator, which should be a high-tension, direct-current dynamo. On the middle disk a suitable brush is provided, and connected between this contact and the middle point of the condensers is an oscillating circuit consisting of a condenser (E) in series with an inductance, which last is connected inductively or conductively to the aerial. If the necessary conditions are fulfilled, and a sufficient electromotive force is employed, a discharge, which is neither oscillatory nor an arc, will pass between the outer and middle disks, and powerful oscillations will be generated in the signaling condenser (E) and oscillatory circuit (F). A peripheral speed exceeding 100 meters per second is desirable, while electrical oscillations of frequency as high as 200,000 per second can be obtained.

The explanation of the arrangement is probably the following: The double condenser is gradually charged so that (C_1) becomes, say, increasingly positive, and (C_2) negative till a discharge takes place across two of the gaps, say (C_2) and (A). This will charge the condenser (E), which will begin to oscillate, and the charge will pass from (A) to (C), which is charged to the opposite potential. The charge of (E) will again reverse, picking up energy at each reversal from the condensers (K). The same process will go on indefinitely, the losses which occur in the oscillating circuit (E F) being made good from the generator (H). If the disk is stationary or only rotating slowly, an arc, but no oscillations, occur, while the efficient cooling of the discharge by the rapidly revolving disk would seem to be an essential condition. When the smooth disk is replaced by one having a series of knobs, the oscillations are not continuous and are distinguishable in an ordinary telephone receiver.

Turning to the question of a commercial service, the lecturer stated that a limited service had been available since October 17th of last year, which, since February 3d of this year, had been extended between London and Montreal. In spite of the fact that the necessary duplication of the running machinery is not yet complete, there has been no long interruption of the "wireless" part of the apparatus. Delays, however, have been caused by failure of the various land lines. Although atmospheric conditions affect the working to some extent, this can be got over by employing extra power.

Referring to the criticisms leveled at transatlantic wireless telegraphy by a certain section of the English technical press, which should, he imagined, exist for the purpose of encouraging and promoting the progress of electrical science and industry, although it always seemed more inclined to champion the particular interests of the cable companies, Mr. Marconi ventured to predict that some of the statements lately published with reference to long-distance wireless telegraphy would make very amusing reading in a few years' time. He asked, therefore, that the new system might be left free to develop itself unfettered by any artificial restrictions brought about by government interference.

Long-distance wireless stations are now being erected in various parts of the world, the most powerful being that at Coltano, owned by the Italian government, and the lecturer was of the opinion that telegraphy through space will soon be in a position to afford communication at a cheaper rate than is possible with cables. Since the transatlantic service was opened and working only a few hours daily, 119,945 words had been transmitted up to the end of February. Whether the new method will injure the cable companies was merely a matter of rates, though no idea of damage to existing interests was contemplated.

The development of wireless telegraphy within the last seven years had caused an increase in useful range from 200 to 2,500 miles, and the next seven years may show still further improvements. That "wireless" was as efficient as the cable service was not maintained, though the lecturer was of the opinion that under equal conditions the balance might be altered.

In conclusion, some popular fallacies, such as the impossibility of sending code messages and the ease of "tapping" were dealt with, and shown to be exaggerated, while confidence was expressed that it was only a question of time, and not a very long time, before wireless telegraphy ever great distances, possibly around the world, would become an indispensable aid to commerce and civilization.

1. From the London Electrician of March 20, 1908.

The Albia (Iowa) Interurban Railway Company has just completed financial arrangements for the construction of a six-mile extension to Hiteman, construction of which will be begun immediately. The four-mile road to Hocking, recently completed, is proving very popular, and it is believed that the new line will be equally successful. It is also proposed to purchase the electric-light plant of the Albia Electric Light and Power Company. For these new undertakings the capital stock of the Interurban company is to be increased from $100,000 to $250,000 and the bond issue from an authorized total of $50,000 of five per cent. bonds to $160,000 of six per cent. bonds. C. A. Ross of Chicago and his associates are interested.

METERS.

By Louis A. Ferguson, Alex Dow and J. E. Montague.

The committee on meters desires to call attention briefly to some of the developments during the last year.

Effects of External Fields.—At the request of a few companies careful investigations have been made by some of the manufacturers of meters as to the effects of external fields on the accuracy of meters running on light loads. While it has been recognized for some time that the registration of meters is influenced by surrounding magnetic fields, we doubt if the extent of the inaccuracies that may result from this cause has been realized by any of our companies.

The error is largely dependent on the position of the bus-bar with relation to the meter, as the same current with the bus-bar only two inches from the meter in another direction had no appreciable effect on its accuracy. Meters are also somewhat affected by their proximity to each other.

It will at once be seen that the installation of meters on switchboards, or close together in meter closets, where they are also frequently very near the building risers, may give rise to considerable metering errors which might be avoided by a more judicious location of the meters.

Demand Indicators.—The watt demand indicator for alternating current is still partly a thing of the future, as far as general commercial use is concerned. There is, however, a pressing need for two classes of such indicators—first, for ordinary consumers, which indicator, therefore, should be simple and comparatively cheap; and, second, for large consumers, where the income is such that the best accuracy and most complete information is necessary, regardless of the first cost of the indicator.

The General Electric Company has recently placed on the market a maximum watt indicator designed to operate on single, two or three-phase circuits.

During the last year the Chicago printing attachment for meters has been developed, and a number are giving very satisfactory service. These attachments can be applied to any integrating wattmeter and automatically print in plain figures the reading of the meter on a 1½-inch paper ribbon at any interval of time desired, as 15 minutes, 30 minutes, or one hour.

Another late development in this line is the Merz demand indicator, which has recently been described in the technical press, and which has been used at Newcastle, England. It depends on the principle of causing the wattmeter measuring the consumption to turn for a fixed length of time a special counting mechanism.

Graphic Recording Wattmeters.—The committee has received an interesting communication on the value of the records of graphic recording wattmeters in enabling electric-light companies to bill their customers on an equitable basis in which attention is called to the following point in regard to them:

"A graphic meter is a maximum-demand watt indicator, as well as recorder, and all of the information that can possibly be obtained from a watt demand indicator can be derived from graphic meters charts. Not only the highest instantaneous peak can readily be determined, but the greatest amount of power for any interval can readily be obtained."

Metering of Special Power.—Many of the member companies have become much interested in this subject because of their present or prospective sale of power for street-railway purposes, for large industrial power, for special purposes of various kinds, as well as the sale and possible purchase of the output of waterpower plants with which they are connected or which may be located in their vicinity. Many such contracts have been and are being negotiated which contemplate much more complete information than that secured from the ordinary wattmeter. In most of these cases it has become not only advisable, but necessary, to have a continuous and complete record of consumption or output, as the case may be. At least two methods might be mentioned; first, integrating wattmeters in combination with graphic recording wattmeters; second, integrating wattmeters in combination with auxiliary instruments or attachments, such as the Merz demand indicator, the General Electric demand indicator or the Chicago printing attachment.

Meter Legislation.—Meters have to an especial degree, during the last year, been the object of legislation, and the tendency of this legislation is all the time more restrictive.

For some years Massachusetts has had a law providing for the testing of electrical meters at the request of a customer. Last year the Public Service Commission in New York state called on the electric-lighting companies of that state for detailed information concerning the accuracy of meters and the methods of testing employed. In Wisconsin the State Railroad Commission is now taking up the meter question, and has announced that it expects to penalize the companies for slow as well as fast meters.

These facts serve to emphasize the necessity of the utmost care in the measurement of electricity and the folly of leaving this matter in the hands of inexperienced men. Any company would stand aghast at a 20 per cent. increase in its coal costs and would probably employ high-priced experts to find out the trouble, but many of them fail to realize that a drop of one per cent. in the accuracy of their customers' meters will affect their profits just as seriously.

The trend of legislation also emphasizes the fact that companies should prepare themselves for meter-regulating ordinances, and, instead of opposing them, should assist in the preparation of regulations which, while safeguarding in every way the interest of the customers, shall not be unjustly oppressive on the companies. As preliminary to a general discussion of the subject, the following points are presented from a communication from a company in New York state, where the matter of meter regulation has gone further than anywhere else in this country:

1. It is frequently proposed that meters shall be sealed by a government official to protect the interests of consumers. This not only is a great hindrance in the way of maintaining meters properly, but the net result of it in cases where it is exacted is that the meters are much more erroneous in their indications than when left unsealed.

2. It is proposed that companies shall provide standards by which all consumers' meters may or shall be tested. It is believed this is a reasonable requirement, and if these standards are periodically checked by the Public Service Commission's inspector, and certificates issued therefor, it will give an authority to these standards which they would not otherwise have.

3. If all the meters are to be tested, it should be done after they are installed on the customers' premises. In Canada it is necessary that all meters before being installed, shall be tested and sealed by a government official, and this is done as they arrive from the manufacturers and before being installed. Such a test is a farce, and is no guarantee of the accuracy of meters, as handling them subsequent to their being tested or local conditions in the plant may result in great inaccuracy. A much better plan would be to provide for the testing of all meters, such test to be carried out where the meter is installed in consumers' premises, on complaint by consumer.

4. Systematic records of the calibration of all meters should be kept open to a representative of the commission at any time.

5. Provision should also be made for test of consumers' meters on complaint, to be carried out by the company, and the result of such tests to be forwarded to the commission for its approval and revision if desired.

6. That a reasonable charge should be fixed for testing of all meters on complaint, but if all meters on which bills for power or lighting service are rendered are to be tested, that this should be at the government's expense.

7. When tests are carried out by an inspector, on complaint by consumer, at least three points shall be taken in the load curve, to be agreed upon in advance, the average of which shall be used in determining whether the meter is accurate within the provisions of law.

1. Extracts from a committee report presented at the Chicago convention of the National Electric Light Association on May 20, 1908.

COURT SAYS DESPLAINES RIVER IS NOT NAVIGABLE.

By the decision of Judge Mack in Chicago on June 25th the Economy Light and Power Company of Joliet, Ill., is given the right to maintain its dam in the Desplaines River at Dresden Heights. Suit was begun by the state of Illinois a few months ago on the contention that the dam would prove an obstruction to navigation and would interfere with the proposed deep waterway from Chicago to the Gulf of Mexico. Judge Mack decided that the Desplaines River is not navigable in its present state, but if in the future the stream should be improved so as to permit of commercial use the state could cause the removal of the dam. As matters stand, the Economy company's rights could only be secured by condemnation proceedings, as Judge Mack held that the canal commissioners did not exceed their rights when they leased the overflow lands at Dresden Heights to the Economy company. The temporary injunction restraining the Economy Light and Power Company from completing the dam was set aside. The case may go to the Supreme Court.

QUESTIONS AND ANSWERS.

MERCURY-ARC RECTIFIER.

W. F. R., Omaha, Neb.: Some time ago I obtained a mercury-arc rectifier tube from a friend and mounted it myself and attached the various resistances. I never succeeded in getting the rectifier to work even after trying out many of the suggestions that I sought from my electrical friends. Lately I acted on the advice of an electrician and tried 220 volts instead of 110 volts as formerly, but with no satisfactory result. Recently I got flashes between the cathode and the starting anode which seemed to burn the mercury to the glass. Now I can get no flash any more and there seems to be a heavy scum on the mercury. What should be done to get rid of it?

Answer.

The tube is undoubtedly burned out and worthless now. Flashing may have been due to excessive voltage or to continued short-circuit between the cathode and some mercury drops left in the starting anodes. This punctures the tube, spoils its vacuum and causes the scum on the mercury, due to oxidation. The tube probably did not work from the start because of some wrong connections. These must be exactly as called for in the instructions furnished with every tube by the manufacturer. The only thing to do is to get a new tube and connect it up with its properly designed appurtenances. A mercury rectifier is a rather delicate appliance to experiment with indiscriminately on the suggestion of well-meaning friends.

HEATING OF GENERATOR FIELDS.

J. A. H., Bismarck, Pa.: I have a small storage-battery plant consisting of 58 cells, a 25-kilowatt booster and a 10-kilowatt dynamo. Both the latter machines are belted to a Nash gasoline engine. When the machines are run about one or two hours the fields of the larger generator become very warm, the speed of the engine becomes variable, and it is almost impossible to keep the current at the normal rate.

Answer.

There is evidently some partial ground or short-circuit on the field which causes an excessive field current to flow. The heating that is produced probably causes a variable contact in the abnormal field circuit, and this results in a variable voltage which accounts for the fluctuating load and speed. The engine is not to blame. Try to locate the defective field coil or impaired insulation that is the source of trouble and repair it without further delay.

PURCHASE OF SELENIUM.

H. G., Chicago: Is it possible to obtain small quantities of selenium for experimental purposes without importing it?

Answer.

Selenium, although a rare element, can be obtained from the large chemical supply houses direct without special importing, as they usually keep at least a few ounces on hand. Its value is about $1.50 an ounce.

BOOK TABLE.

Audel's Gas Engine Manual. New York: Theo. Audel & Co. 1908. Pp. (5⅜ by 8⅛ inches), xxiv., 469, with 156 illustrations. Price, $2.

The aim of the compilers of this book was to provide a practical treatise relating to the theory and management of gas, gasoline and oil engines. It was primarily intended for gas engineers and machinists operating machines driven by internal-combustion engines. For this reason the book is written in a simple style and is devoid of technical intricacies. In the first part of the book the laws and actions of gases are considered and the theoretical and actual working principles of these engines explained as they apply to the two-cycle and four-cycle engines. Fuels and gas producers are then discussed and also the design and construction, governing, ignition, installation and operation of such engines. A large number of supposedly typical gas and vapor engines are described and illustrated. There are long chapters on the testing of engines and hints on management and suggestions for emergencies. This is probably the most valuable part of the book. As a whole the book is of considerable value to anyone desiring a general knowledge of the gas engine so as to be able to operate it with some intelligence and to select a machine suitable for any particular line of work.

THE SMALL STATION AND ITS ECONOMICAL OPERATION.[1]

By J. T. Whittlesey and Paul Spencer.

The object of this paper is to present the subject of the design and operation of the small central station; that is, the station which supplies a district having a population of 20,000 or less.

The manager of the small plant generally has to be his own designing as well as his own operating engineer. He seldom, if ever, can afford to call in a consulting engineer to guide him in his work, and if he did so, he would frequently run the risk of being advised along the specialized lines in which the consulting engineer called in had been working, and would have his plant filled up with expensive appliances and apparatus whose usefulness had been demonstrated under situations quite different from that which confronts him. There is undoubtedly a tendency in electrical engineering as in all other matters to follow the prevailing fad, and many small plants throughout the country have, in order to keep in the fashion, adopted complicated and costly improvements, entirely unsuited to their conditions.

It is the purpose, therefore, of this paper to take up the question of design and operation of the small station in the simplest possible manner, as the writers feel that simplicity is one of the most important elements toward total economy.

Danger from Too Much Refinement.—It should be a cardinal principle in all station design that no piece of apparatus or any appliance should be installed that cannot justify itself, not only on the basis of the economy promised by the manufacturer of the appliance, but also on the most conservative basis; full consideration being given to its first cost, its depreciation, the additional labor that its use may entail, and the question of extensive repairs, which can be made in a small plant only with difficulty.

Every additional piece of apparatus in the station is an additional source of possible trouble and cost. It will be found that many of the so-called labor-saving devices and other promised adjuncts to economy are applicable only to stations of comparatively large size and have no place in such stations as this paper is considering.

The simple design is always the safer one to adopt for the manager of a small station. If he will be content with following out the lines suggested in this paper for the design of his plant, he will save himself a great deal of time and useless worry in attempting to decide the question of economy to be obtained from the refinements recommended, and he will certainly not run the risk of making the serious and costly mistakes into which some managers have been drawn.

Need for Definite Plans.—While it is important that the design of the station should be simple, simplicity of design does not mean lack of design, and it is probably of even more importance in the cost of the small plant than of the large plant that it should be arranged at the start so that it can be developed along definite lines.

Every station manager should forecast for himself the development of his load so that he may have some idea of the conditions it will be necessary for him to meet from year to year in the future. It is an excellent plan to assume some reasonable percentage of growth, in order to ascertain what point at the end of a period, say, 10 years, the expected load on the station may reach, and to draw up some tentative plan, at least, to meet such an estimated load, working backward on the problem to see when the additional apparatus will have to be installed, in order that the capacity may keep pace with the growing load.

With such a more or less definite plan in mind, the extensions can be made from year to year in the most economical manner, so far as first cost is required, and with a uniformity in the design and size of apparatus that will help toward efficient operation. Such a definite plan will also enable the station manager to avoid the costly rearrangement of buildings and of apparatus, which have so frequently been necessary in the past and have swelled so much the station's scrap pile.

Charging Off Improvements.—It should be remembered that in the future the question of replacement may have to be handled on quite a different basis, so far as the method of charging the cost is concerned, than in the past. Everything points to the fact that all companies, sooner or later, will be operating under restrictions imposed by state commissions and that the value of displaced apparatus can no longer be charged to capital account, as has been done in many cases in the past, but will have to be taken up in some way in the operating account of the station. It therefore becomes of the utmost importance that each station should be able to grow along definite lines, utilizing to the end of its useful life all the apparatus it may have.

Extensions of Old Plants.—It is, of course, comparatively easy, if any thought whatsoever be given to the subject, to lay out a new station to provide for some such definite method of growth. Electrical apparatus has now reached such a point of development and of standardization that replacements, due to the changes in the art, are much less likely to occur in the future than in the past.

It is a more difficult problem to take an old station, which in many cases is but a haphazard collection of all sorts and conditions of apparatus, and to provide a definite plan to bring order out of chaos. It is, however, always possible to provide that the extensions shall be carried out with some plan in view, and generally possible to make this plan one that will fit in more or less successfully with the existing station. We would therefore impress strongly upon the central-station manager the extreme importance of his making, as early as possible, an intelligent study of his future development and of providing a systematic plan to which he may work.

Design of the Station.—Assuming that a new station is to be built, certain broad features of the design can be laid down as essential.

First of all, the plant will undoubtedly supply alternating-current service, generating and distributing at 2,300 volts, multi-phase, 60 cycles. One class of apparatus only should be installed, and the entire business, whether commercial lighting, street lighting or power, should be supplied at 60 cycles, alternating current.

In choosing a site one should be selected that will have railroad facilities, and, if possible, a supply for condensing water, as a condensing plant will be desirable when the load has grown to a certain point. The site should be of suitable shape and sufficiently large to provide ample facilities for future extensions. It is also desirable that there should be room on this property for stable or store room, as economy in the entire operation of the company will be gained by having all such buildings located at one point. The site chosen should, if it can be obtained without sacrificing other advantages, be close to the center of the town. In this way distribution will become simpler and the plant itself and other buildings will be more convenient for the employes and more directly under the supervision of the manager.

The design of the engine and boiler room should of course provide for indefinite extension. This means a parallel engine and boiler room.

The station itself should be fireproof, with brick walls, concrete floors and steel roof. A crane in the engine room is desirable, but not necessary. The gutters and flashings should be of copper, and window frames, doors, hardware and other details should be substantial, so as to keep down the cost of building repairs.

The stack should be of brick, as steel will in every case be found to be th[illegible] pensive in the end, both because [illegible]ire a constant maintenance charge fo[illegible]g, and because, sooner or later, they mu[illegible]

For a small load, say, under [illegible] we believe that a simple non-c[illegible]nsing station will show the greatest total economy, including not only economy in operation but interest and depreciation on the apparatus installed.

Consideration should also be given to the fact that in such a station, with only a small number of men employed, it is impossible to obtain, for the wages paid, very expert men, and that, therefore, the best results will be obtained by keeping all the apparatus as simple as possible.

The generating unit should be direct-connected with engines, preferably of the Corliss type, of moderate speed. The boilers may either be fire-tube or water-tube, but should be hand-fired, with no elaborate machinery for handling fuel or ashes. The station auxiliaries should be reduced to a minimum.

The exciters will be belt-driven from the engines, and the only steam auxiliaries will be a feed-water heater and the boiler-feed pumps.

The switchboard design should provide for exciter panels, located in the middle of the board, with sufficient space left for all future extensions. A Tirrill regulator will be found most desirable. Its first cost is low, and in a station where labor is to be reduced to a minimum it will be necessary to have such a voltage regulation if good service is to be given. With the exciter panels located in the middle of the switchboard, the generator panels will extend as may be needed on one end and the feeder panels on the other. All connections from the generators to the switchboard should be carried in cable under the floor, and the outgoing feeders should also be carried under the floor to a wire tower at the corner of the building.

Fuel should be delivered to the plant on a railroad siding extending the length of the boiler room and parallel to it. If possible a trestle should be installed, so as to provide headroom for dumping the coal from the cars, which can be stored under the trestle and wheeled to the boiler room as needed. Sufficient space should be provided under this trestle to permit not less than a month's supply of coal being carried at the time of the station's maximum output.

Description of Proposed Plans.—A general plan of the station embodying the above general ideas is shown in Figs. 1 and 2.

It will be noted upon examination of these drawings that the building suggested is extremely simple in design, and contains no basement, either under engine or boiler room. The steam piping is overhead with the exception of the free exhaust lines from the engines, and the arrangement is such as to give the shortest possible length of connections from boiler to engines.

The omission of a basement is primarily to reduce cost, but it will also result in cheaper maintenance, as it is found that basements in such stations usually become filled up with rubbish, which must be cleaned out, and when used to accommodate pipes the work of repairs on them is greater than when they are placed overhead. Leaks frequently are allowed to exist, causing constant loss, which would otherwise be immediately noticed and stopped.

While an ash hopper and basement under the boilers keeps the boiler room clean and enables more rapid and easier cleaning of fires, it increases the cost of getting out ashes and gives additional space to be kept clean. The additional cost is practically prohibitive.

The solid portion of Fig. 2 indicates the building as it would be constructed for immediate needs; namely, a maximum load of 600 kilowatts, containing three 300-kilowatt units. The future extension to take care of the growth in load for 10 years is indicated by dotted lines.

The sketch is given simply to indicate the general features of the type of station recommended in this paper; the details, of course, would be altered to meet local conditions and requirements.

It is assumed that this station is to be built to meet a present maximum load of 600 kilowatts, and that this load will be increased at the rate of 10 per cent. per annum compounded, and that the load factor will be equivalent to 2,200 hours per year for each kilowatt of the maximum demand. This station can be built at a cost of from $125 to $[illegible] per kilowatt.

Load Output and Apparatus.—Table I [illegible]e growth in maximum load and outp[illegible] sta- tion capacity installed to me[illegible]d, for a period of 10 years.

Table I.—[illegible] Apparatus.

Yea[illegible]	[illegible]ad.	[illegible]put.	Units.	Total Capacity Kilowatts	Available C'pacity* Kilowatts
[illegible]	600	1,320,000	3 300-kw.	900	750
[illegible]	660	1,452,000	....	900	750
1910......	726	1,597,200	....	900	750
1911	799	1,757.800	1 500-kw.	1.400	1,125
1912......	879	1,933,800	....	1,400	1,125
1913.....	967	2,127,400	....	1,400	1,125
1914......	1,064	2,340,800	....	1,400	1,125
[illegible]15......	1,170	2,574,000	....	1,400	1,125
[illegible]	1,287	2 831,400	1 500-kw.	1,900	1,750
[illegible]	1,416	3,115,200	....	1,900	1,750
[illegible]	[illegible]558	3,426,700	....	1,900	1,750

Note.—[illegible] per cent. Output, 2,200 kilowatt-hours per max[illegible]
*Available capac[illegible] down with 25 per cent. overload on remaining app[illegible]

It will be noted that th[illegible] installation of three 300-kilowatt units would c[illegible] the load safely through three years with one unit out of service, at which time a 500-kilowatt unit would be installed, which would carry it five years; a second 500-kilowatt unit would then have to be purchased, which would give an available capacity more than sufficient to carry the load through the remaining three years.

The complete plans of the station, including the dotted portion, show all of these units installed, with necessary boiler capacity. Such a station would have a total capacity, with the largest engine out of service, of 1,750 kilowatts, allowing a 25 per cent. overload on the units available for service.

There is also given in Fig. 3 an assumed load curve for an average maximum day. On this sheet is also shown the capacity of generators running to meet the load, from which it will be seen that the 300-kilowatt unit will be running at only approximately half load during the light portions of the day and night. This would of course increase the fuel consumption during these hours over what it might be with a small unit of exactly the necessary size to meet the present load. It is expected, however, that in a very short time the day load would be increased, so that the 300-kilowatt unit would be operating under more economical conditions. Should the territory in which the station is operating be of such character that it is impossible to obtain any great amount of day load, it

1. A paper (slightly condensed) read before the National Electric Light Association at Chicago, May 19, 1908. The authors are practical central-station men well qualified to treat of this useful subject. Mr Whittlesey is chief engineer of the electrical department of the Public Service Corporation of Newark, N. J., and Mr. Spencer is inspector of electric plants for the United Gas Improvement Company of Philadelphia.

would be desirable, perhaps, to install a somewhat smaller unit than that shown on the plan.

Operation.—The operation of such a plant would require a minimum of labor and repairs. From experiences with similar plants a total of six men is amply sufficient, including one chief engineer, two running engineers, two firemen and one fireroom helper. The hours which these men should work are shown in diagram on the load-curve sheet. By lapping the chief engineer and the helper, we should have four men in the plant over the peak of the load.

The overlap covers the afternoon hours, giving the chief engineer the best opportunity to overhaul apparatus and providing him with the necessary help to carry on his minor station repairs.

Maintenance Low.—With the plant as described there will be practically no continuous repair work, with the exception of that required to keep the boilers in first-class condition. There will be but two single-cylinder slow-speed engines and one boiler-feed pump running at a time during the peak, and only one engine and one feed pump for 20 hours of the day.

As this is a non-condensing plant, the steam pressure will be low, not over 120 pounds, which will make it possible with a small amount of labor and attention to keep the piping, valves, packing, etc., in perfect condition, so that there should be no excuse for their not being maintained always at initial efficiency, even with the limited station force employed. When the engineer of a station is relieved of the care and annoyance ordinarily caused by condensing apparatus, mechanical stokers, forced draft and other complications, his whole attention may be given to maintaining the efficiency of his boilers and engines and seeing that they are operated to the best advantage under the load conditions.

Points to Be Watched.—The following particular points are brought up as essential to the economical operation of the station:

In the engine room it will be important for the chief engineer to see that the capacity in apparatus running follows closely the load curve. All units should be run at their highest possible point of efficiency. It is always desirable to run them overloaded rather than underloaded, and the engineer should not be afraid of carrying his units up to their full overload point.

The chief engineer should certainly have an indicator and take frequent cards so that he may know at all times the condition of his valves and cylinders and remedy any defects that may show up.

But it is in the boiler room that the greatest possibility lies of wasting or saving fuel and improving the station economy. No positive rules for firing can be laid down in general on account of the differences found between fuels, and also on account of the various methods of firing adopted by different men, which if properly carried out may result equally well.

The cutting in and out of boilers and banking of fires must be watched as closely as the running of the engine room to make the boiler capacity meet the loads most economically. With most boilers of good design it is found more economical to overload them 25 per cent. above builder's rating, and in order to carry a short peak to go to 50 per cent. or more rather than cut in an additional boiler. The slight falling off in efficiency of a boiler at these high ratings does not consume as much fuel as that required to keep one boiler banked, which can only be used for a few hours a day.

With a non-condensing plant there is no difficulty in getting hot feed-water always above 200 degrees, so that this point will not trouble the engineer.

The combined boiler efficiency, including the grate and heating surface, can be kept up to the highest point only by constant attention to the condition of the boiler setting and the tubes. Draft gauges and thermometers, which cost but little and are very simple to use, will give the engineer exact information with regard to the condition of the boiler and help the firemen to get the best out of the boiler and the coal. A thermometer should be installed on the feed line into the boiler and draft gauges on uptakes and immediately over the fire. A high-reading thermometer for getting flue gases should be used by the engineer occasionally to tell him the temperature of his flue gases, which will be a guide on the efficiency of the boiler. Periodical readings of the draft at different points through the boiler should be made to determine the loss of draft and see if the air leaks are excessive.

One great source of loss of boiler efficiency is the bad condition of boiler setting, cracks around drums and other points in the setting which admit cold air, decreasing the draft and lowering the temperature. Most plants have an excess draft available from the stack, so that even with a very bad condition in this respect ample draft is still obtainable for burning the coal as fast as is required. This results in a continuous loss unknown to the engineer, unless investigation with draft gauge or by torches is made, as suggested.

Everyone is perfectly familiar with the necessity of keeping the boiler clean, both inside and out, to maintain its efficiency. The frequency of such cleaning will depend entirely upon the quality of fuel and water used. An increase of 10 per cent. in boiler efficiency can easily be made, even where conditions are not very bad, by repairing, setting and cleaning boilers.

An automatic damper regulator is essential, especially in a small plant where natural draft is used.

Value of Station Records.—It is hardly practicable in a small plant for the engineer to make elaborate tests, flue-gas analyses, engine-efficiency or evaporation tests, but the total running results of the plant can be kept very accurately by a proper method of records, and it is very essential for the chief himself to keep such records or station log. He is not responsible for two factors greatly affecting his cost, namely, the nature of the load on the plant and the fuel furnished him. He can, however, by keeping accurate records, furnish the management with the information necessary for them to determine whether or not the fuel purchased is the best for the price and how the cost of production can be decreased by improving the load factor. No scientific test is as good as a comparative run of several months under similar conditions.

In many plants of this size the output and the shape of the load curve are very similar from day to day and from month to month, so that by obtaining the amount of coal burned and the output, a very accurate comparison can be made with different fuels, methods of firing and handling of the units.

It is essential, then, for the economical operation of a small plant that integrating wattmeters be installed on each generator and the daily output kept on the log sheet. The indicating instruments should also be read at sufficiently frequent intervals to enable a daily load curve to be plotted. Every pound of coal and ash should be weighed and the record turned in for each shift or period of load.

The engineer will have his payrolls and bills for material, so that with a very small amount of bookkeeping he can get the actual cost of labor, fuel, oil and waste, repairs to buildings, repairs to engines, repairs to boilers and repairs to electrical apparatus.

It is hardly possible in such a plant to subdivide the labor, as the ordinary repair work and maintenance of apparatus is done by the regular station help, part of whose time is also put into operating. Any extraordinary repairs requiring outside help or machine work will be entered up separately.

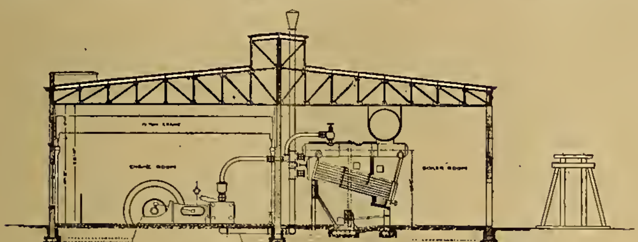


FIG. 1. SECTIONAL VIEW OF ARRANGEMENT FOR SMALL STATION.

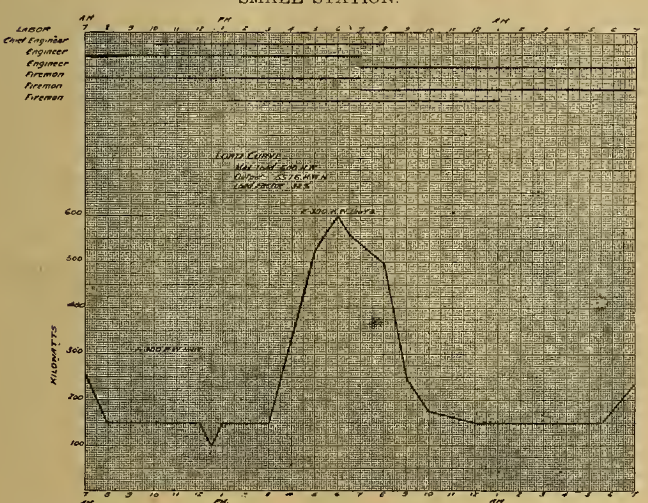


FIG. 3. ASSUMED LOAD CURVE FOR AVERAGE MAXIMUM DAY.

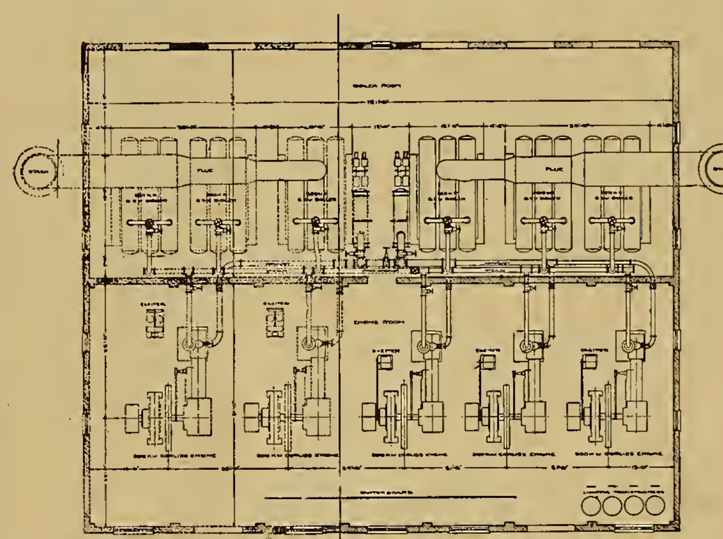


FIG. 2. PLAN OF GENERAL ARRANGEMENT FOR SMALL STATION.

The engineer of the plant should not hesitate to try experiments in operating, provided of course the service is not endangered; such as different hours of cutting in and out boilers, overloading and underloading boilers, cutting engines in and out on the load at different hours. But these experiments will be of no value unless they follow out a definite programme to its final results and unless records are kept accurately and analyzed intelligently to compare the results obtained. Conclusions are often jumped at in station operating which at sight seem apparently correct but upon analysis prove to be entirely wrong. Good records and a careful analysis is the only proof that can be accepted.

Improving Old-plant Results.—In taking hold of an old plant which is not operating at good efficiency it is difficult sometimes to locate the trouble and correct it. It is of course necessary at first to secure accurate records as already described. This, however, will only show the total pounds of coal per kilowatt-hour and will not tell where the losses are.

The easiest point to be attacked first is the engine economy, which can be very readily brought up to its highest possible point with the engines in use. The records will then show if any gain in efficiency has been made.

After having brought the engines up to their best efficiency for the type, the boilers should then be carefully inspected and cleaned up. Boilers that have been neglected will require heavy expenditures to bring them up to a good standard of efficiency. This, however, must be done if the manager is determined to get good results from his plant in the end. No patching or partial cleaning of a boiler should be made unless it is absolutely necessary at the time to keep them in operative condition. Thorough repairs only will pay, but they will pay well in fuel saved, as the records will show if they are properly kept.

Detail of Operating Cost.—The operating costs of such a plant are given in table II. The figures are conservative for a new plant, well built along the design suggested, and have been bettered in actual experience. Two columns of cost are given—first, for a station having a load of 600 kilowatts and an output of 1,320,000 kilowatt-hours per year, and the other for the same station with twice the output and additional capacity necessary.

Table II.—Operating Cost.

Item.	Present Output.		Double Output.	
	Amount.	Per Kw-Hr.	Amount.	Per Kw-Hr.
Superintendent	$1,000	0.0757 cent	$1,000	0.0379 cent
Labor	5,040	0.3819 "	6,480	0.2454 "
Fuel	9,723	0.7366 "	19,446	0.7366 "
Water	634	0.0480 "	1,268	0.0480 "
Oil and waste	600	0.0454 "	800	0.0303 "
Miscellaneous supplies and expense	500	0.0378 "	600	0.0227 "
Repairs, buildings	100	0.0076 "	100	0.0038 "
Repairs, steam	700	0.0530 "	1,000	0.0379 "
Repairs, electrical	75	0.0057 "	100	0.0038 "
Total	$18,372	1.3917 cents	$30,794	1.1664 cents

Notes—Coal based upon Pennsylvania bituminous at $3 per ton, 5.5 pounds per kilowatt-hour.
Water based upon cost at 10 cents per 1,000 gallons, 40 pounds per kilowatt-hour.
Superintendent's salary at $3,000, one-third charged to production.
Labor: Chief engineer at $1,200 per year. Two engineers at $900 per year. Two firemen at $720 per year. One helper at $600 per year.

The figures for labor and fuel will vary considerably in different localities and under different conditions of the labor and fuel market.

"WIRELESS" TELEPHONING IN DETROIT.

The Detroit Times of June 27th is authority for the statement that Thomas E. Clark of the Clark Wireless Telegraph-telephone Company of Detroit has perfected instruments which place the wireless telephone in practical and commercial use.

"During the past week," says the newspaper mentioned, "the Clark wireless telephone has been placed in operation in connection with the Clark wireless station, and the new steamer City of Cleveland on each trip in and out of Detroit has been in communication with the Detroit station to a talking distance of 20 and 25 miles. Mr. Clark explains that the working theory of the wireless telephone is to provide means for radiating a stream of electrical waves sufficiently continuous to transmit the higher harmonics on which the quality of the voice depends and also to provide means for the modifying of this stream of waves in accordance with the sound waves so that the continuously responsive receiver will give indications proportionate to the energy received and be capable [illegible] responding with sufficient rapidity to the [illegible]ch harmonics. The Clark wireless telephone is [illegible] ated by first talking into the transmitter and t[illegible] ing over a listening key to listen to the respo[illegible] from the other end, although Mr. Clark is n[illegible] working out a method so as to be able to talk an[illegible] listen simultaneously.

"Mr. Clark believes there is no immediate prospect that wireless telephones will take the place of the present local wire telephone exchanges, although he says there is no difficulty in regard to the number of people that can be connected by wireless telephone to talk with one another. The fact remains, however, that each subscriber must have his own generating station or storage battery to give energy to the transmitter in talking. Just at the present time no simple method of interconnection is known which would be practicable if placed in the hands of the individual subscriber. No doubt this will be developed, as it would be very convenient to have each individual subscriber call up directly any person he wished without having to call through a central telephone exchange. The great field of usefulness of the wireless telephone is, of course, for communicating from one vessel to another."

MINIATURE TUNGSTEN LAMPS.

Tungsten lamps for battery and low-voltage work of practically all sizes from ½ to 24 candlepower that correspond to the ordinary miniature carbon lamps have now been perfected by the General Electric Company and are ready to be placed on the market. They are suitable for voltages from 1½ to 20 and can be used wherever a miniature lamp is of service. When the tungsten lamp first came out it was believed that its manufacture for anything but standard voltages and large candlepowers was impossible. Now the tungsten lamp can be made in practically any size and for nearly all kinds of service for which the old carbon-filament lamp has been used. The new tungsten miniature lamps are made at the company's main lamp works, Harrison, N. J.

THE GAS ENGINE'S PROBABLE FUTURE.[1]

By Sumner B. Ely.

In trying to forecast how far the gas engine is likely to displace the steam engine, no treatment of apparatus is attempted, merely the detail specific reasons for the general conclusions reached.

Up to the present time, in this country, little attention has been paid to the invention or improvement of fuel savers. Have not the compound and triple-expansion engines received most of their perfecting abroad?

We are primarily inventors of labor-saving machinery, and this is, of course, to be expected, for a new country like our own has a scarcity of labor and often an abundance of fuel. It is only within a comparatively few years that we have given fuel much consideration. A very excellent illustration of this is the way natural gas has been wasted and thrown away.

It is very logical, therefore, to find the gas engine being perfected in Germany and other European countries where fuel is scarce and of high cost, and labor cheap. It is true that there have been a large number of gas engines built in this country for a great number of years back, but they have been generally confined to small-unit sizes and their application has been much limited by the restricted conditions under which they would operate. And while these have had good success under certain conditions, it cannot be said that they have so far been likely to displace the steam engine. It is, therefore, necessary for us to turn to Europe, and especially to Germany, to find out what has really been accomplished in this field. The development in the last few years has been very rapid.

At Differdingen can be seen gas engines direct-connected to blowing cylinders and others to electric generators. These are in units of 800 horsepower and 1,000 horsepower. Blast-furnace gas is used in the engines and cleaned of dust by means of fans and scrubbers. It is not uncommon to see installations in Germany of this kind at the large blast-furnace plants. At one plant I recollect seeing a machine of the Oechelhauser design of 30 by 40-inch cylinder connected to a blowing cylinder of 72 by 40 inches. This is merely to convey the idea that many good-sized gas engines are running successfully with no more breakage or stoppage than a steam plant. A number of American engine companies have lately obtained the rights to exploit and manufacture some of the most successful foreign designs. The large gas-engine plant of the Lackawanna Steel Company, at Buffalo, N. Y., is now running, and some other large installations are under construction. The gas engines at the Lackawanna Steel Company use blast-furnace gas and drive both electric generators and blowing cylinders. I understand something like 40,000 horsepower has now been installed.

The fuel saving a gas engine will effect over the steam engine is well known. We all appreciate its high mathematical heat efficiency; also that the cooling water, used to keep down excessive temperatures that would otherwise prevent proper mechanical working, carries away so much heat that this high efficiency is nearly cut in half. Furthermore, useful heat is thrown away in the exhaust, so that an engine in practice develops, perhaps, 25 per cent. efficiency. While many tests show much more than this, 25 per cent. is probably a conservative figure that can be obtained in practice. It must always be remembered that a gas engine gives its maximum efficiency only when carrying full load and that the efficiency falls off as the load is decreased. For a comparison with the gas engine, it is doubtful if a compound condensing steam engine will do better than 12 per cent. or 13 per cent. efficiency. A boiler with its furnace that gives 70 per cent. is a very good one, and, combining this with the steam engine, we have a total efficiency of less than 10 per cent. against the gas engine's of 25 per cent.

The above case is applicable to blast-furnace work, where the common practice is now to burn the blast-furnace gas under steam boilers; or it is a comparison where natural gas is used.

If, however, the gas for the gas engine is generated from coal in a gas producer, then the efficiency of the gas producer must be taken into account.

Taking all of the above efficiencies into consideration and also the load factor, we may perhaps say of the average case met with in practice, that about one-half less fuel will be required by the gas than by the steam engine.

Some articles have been published stating that the gas engine on blast-furnace gas would use for the same work only one-fifth or one-sixth of the gas required by steam boiler and engine. Most of these articles are based either on calculated results or exceptional tests, and the conservative engineer will be doubtful of such enormous savings working day after day in actual practice.

Let us now turn to the disadvantages of the gas engine. One of the most serious is its inflexibility regarding overloading. As already stated, the maximum efficiency is at maximum load, and consequently to get the economy, the builders have generally in the past sold an engine which would just about carry the load with practically no margin of power left. In most shops, particularly with the smaller engines, there is always a tendency to add more and more load from time to time as new machinery is added or extensions are built. A steam engine, if necessary, can take steam full stroke and its power thus greatly increased. To be sure, its efficiency falls off, but naturally the purchaser will consider excess power of far more convenience if not of actual value. He does not care to buy a new engine every time he belts a few more machines onto his shafting.

The maximum load consideration always comes up in the case of varying loads. For instance, after designing as heavy and large flywheels as practicable, suppose that we will need 700 horsepower the greater part of the time, but occasionally as high as 1,000 horsepower will be needed. A steam engine rated at 700 horsepower, if overloaded 38 per cent., viz., to 1,000 horsepower, would not show much falling off of efficiency. A gas engine to give a good efficiency should not carry less than 80 or 85 per cent. of its maximum capacity. This would mean we would have to install a gas engine of at least 800 horsepower, or, better still, 850 horsepower.

A great many figures have lately been published including load factor, interest on investment, depreciation, etc., but without going into this, suffice it to say that with coal costing about $2 per ton or more, a resultant saving (except in exceptional cases) can be shown in favor of the gas engine, this being more or less depending on the many conditions which always enter the problem.

As already stated, in the average case the gas engine shows about one-half the consumption of the steam engine.

Before leaving this point, it is interesting to note in some of the foreign installations, how, in blowing cylinders connected to gas engines, the air pressure is increased. Suppose a gas engine is designed to give an air pressure of 20 pounds per square inch when working at full capacity, and now suppose we desire a pressure of 30 pounds to help out the working of a blast furnace. We might have installed an engine which would give 20 pounds when working at, say, half its full load, but not only would this be expensive in gas consumption but also in first cost of installation.

The method referred to provides the blowing cylinder with a valve, arranged so that when excess pressure is wanted this valve allows the piston to pump into the atmosphere for the first portion of the strke. It then closes, and the extra speed and impetus which the piston has gained brings up the pressure.

Of course, the volume and weight of air pumped falls off, but it is stated that double the normal pressure can be obtained in this way.

The difficulty of reversing a gas engine is often advanced against it, but with the many satisfactory clutches, both for very large and small work, this objection does not mean much.

I want to speak now of what, to my mind, is really the key to the general use of gas engines, and that is the production of a proper gas for the engine to run on. Experience shows that gas engines can be designed (not that all are) which will run successfully from a mechanical standpoint; experience also shows that blast-furnace gas can be cleaned successfully, also that natural gas can be used, also that gas can be made from coke or anthracite coal, but it has not shown that we have an altogether satisfactory gas producer for bituminous coal, and until such is put on the market it is hard to see how the general adoption of gas engines can take place. Bituminous coal is our great commercial fuel, and the universally accepted engine must run on it.

It is not an easy matter to get a gas from bituminous coal which is clean. For gas-engine work, if much dirt is present, it cakes and bakes on the cylinder walls, becomes incandescent and explodes the charge at the wrong time. There are, however, one or two makes of producers that come very near being generally satisfactory, but are complicated by washing and cleaning apparatus, and to obtain economy it is often necessary to sell a by-product. Installations for small plants are hardly expedient.

There is, however, at present considerable experimental work going on, and I for one believe it will not be many years before we see gas engines producing a brake horsepower per pound of bituminous slack coal from a simple and efficient gas producer.

1. A paper read before the Mechanical Section of the Engineers' Society of Western Pennsylvania at Pittsburg, February 4, 1908.

To sum up the previous remarks, to my mind before the gas engine can come into very general use we must first have a simple and satisfactory bituminous gas producer. Granting that this will probably come, the gas engine still for general use is hampered by its inability to carry overloads. However, as time goes on and the price of fuel goes up, as it must, due to the economic law of supply and demand, we may expect a good many gas engines to replace steam. First, however, before economy, the general user appreciates the flexibility of the steam engine, and I cannot believe the gas engine will ever entirely displace the steam engine. The gas engine will fit into certain conditions and places admirably, and its field will undoubtedly be enormously increased with the advent of high-priced fuel and a proper gas producer.

DISCUSSION.

Mr. Hardie: Relating to Mr. Ely's reference to the non-success of bituminous gas producers when applied to power development or the driving of gas engines, would remark that, while such may be the case in connection with comparatively small installations of the suction type, in large installations operating for power only, or for power and fuel purposes combined, highly satisfactory results have been obtained from bituminous coal.

On the continent of Europe and in Great Britain large and numerous installations of this class are in successful operation, meeting the demand of central power stations and the various requirements of the metallurgical and manufacturing industries, included in which is the operation of large-unit gas engines. In connection with these operations, however, very important economies are effected from recovering, in the form of sulphate, the ammonia originally contained in the coal. Throughout England and Scotland such well-known firms as Armstrong, Whitworth & Co., Vickers, Son & Maxim, John Brown & Co., and the William Beardmore Company, severally engaged in the steel manufacturing business, operate extensively, and in some cases entirely, by Duff recovery plants adapted for generating gas from bituminous coal, using the gas for the melting and heating of steel, and after cleansing, in the gas engines operating throughout the works. It should be of interest to note that Mr. Beardmore, whose company operates in steel works and shipyard an equivalent, in Duff plants, of over 100,000 horsepower, stated, in the course of a speech made after the recent launching of a battleship, that this yard was unique in that no steam is used as a motive power, internal-combustion engines being used to generate electric power to operate the motor-driven machines throughout the works. He further stated that from the gas used for power purposes enough sulphate of ammonia was recovered to pay their entire coal bill.

Mr. Stucki: Some time ago I had occasion to look into the question of installing a producer plant, and found that in a large size by-product plant the cost of the coal at about $1.50 per ton will be entirely offset by the by-products, and this is said to hold true for installations of not less than 75 to 90 tons per day of 24 hours.

To abstract the tar, which is the most difficult operation in cleaning gas for power purposes, several methods are employed. The United States government, during the St. Louis Exposition, made exhaustive experiments with producers, and used the mechanical or centrifugal washer, which precipitates the tar against the periphery of a rotating housing, and from which it is afterward washed out. This device is much used in Europe, but it is somewhat bulky.

Another method consists of an inverted producer, which has lately been perfected to such an extent that it is now offered to the trade. It now appears that the principal difficulty in the use of bituminous coal for gas-engine purposes, the elimination of the tar, has been successfully overcome.

The economy of gas power is forcibly illustrated by the fact that gas-engine installations are now sold under a guaranteed fuel rate of one pound of coal per horsepower-hour, while a high-speed steam-engine plant consumes 3½ pounds, and a triple expansion engine 2.3 pounds.

Mr. Flint: I know from personal observation that in England both anthracite and producer gas are used extensively. Dowson anthracite producers are often used in small size electric-light and power plants, and Mond bituminous producers are frequently installed where large amounts of power are required. The Mond producer plants furnish a gas adapted to manufacturing purposes, such as heating soldering pots and other light work, in addition to running gas engines.

I ran across a rather interesting practice in Coatbridge, Scotland, where they were using bituminous coal in their blast furnaces, and were recovering sulphate of ammonia, tar-oil and pitch from the gas. They then used the purified gas for their stoves and for running a blast-furnace gas-blowing machine. After separating the tar-oil and pitch they recombined them in proper proportions to meet the demands of the trade.

Referring to gas-engine overloads and efficiencies, if there be installed a gas engine which will normally run at half load and which will occasionally be called upon to develop twice that power, the engine will use 25 to 30 per cent. more gas per horsepower when running on the usual half load than when running on full load. For instance, an engine which uses gas containing 11,000 British thermal units per brake-horsepower-hour at full load, should consume about 14,000 British thermal units per brake-horsepower-hour on half load, which is still good economy, but the increased first cost of such a plant is a disadvantage. This excessive cost can be avoided by putting several gas engines in a central power house whose peak load will be a much smaller per cent. of the average than would be the case if each gas engine were direct-connected to its mill. In such a central power plant the gas engines can be operated at or near full load most of the time by starting or shutting down units to correspond with the expected changes of load.

Mr. Lyons: Regarding the question of overload, for a plant of 700 horsepower I would suggest installing three 350-horsepower engines, operating two of them all the time at practically full load and maximum efficiency.

The time when the overload occurs is known, and to provide for the same, the third engine should be started and operated during the period of overload. The rolling mills provide an excellent opportunity for the utilization of the waste gas from the blast furnaces by generating electricity and using it for driving the mills by electric motors.

One of the rail mills at the Edgar Thomson Steel Works is successfully operated by electricity, and a large plate mill of the Illinois Steel Company at Chicago is operated by electric motors. Electricity for driving the steel mills has been in use for a number of years in Germany, the development being caused by the enforced necessity for a lower cost of production.

We are all interested in the question of by-products, as it involves the welfare of the nation. In some of the states the soil has been so impoverished by continuous use and neglect to replenish its richness by fertilization that the yield at present is only about one-fourth what it was when first cultivated.

The production of crops destroys the nitrogen in the soil. If nitrogen is recovered from the coal in the production of gas in the form of sulphate of ammonia, it provides a very good material for enriching the soil. Nitrogen being a noncombustible gas, its removal from the gas is an advantage. On account of the economic principles involved, the subject should receive serious consideration from every patriotic citizen in an effort to assist President Roosevelt in conserving the natural resources of this great nation.

Mr. Hirsch: Supplementary to Mr. Lyons' remarks it may be interesting to note that the Indiana Steel Company at Gary is putting in engines to be operated by blast-furnace gas. When the plant is completed they will have about 100,000 horsepower for blast purposes and for generating electric power. The Edgar Thomson plant, to which reference has been made, has three units, two blast engines and one driving an electric generator, each of the units ranging between 2,000 and 2,500 horse power.

The Gary plant will have a number of steam-driven blowing engines to start and operate the furnaces until they generate sufficient gas to operate the gas engines.

M. L. J. Affelder: I would like to know how the cost of maintenance of the gas producer compares with the cost of maintenance of boilers, and the amount of labor required.

Mr. Hardie: As the plants already referred to work steadily under very light and well-regulated pressure the need for repairs is consequently small. It is found that, with ordinary intelligent care exercised in operating, the producers will run for long periods without further attention than that usually given such equipment at a week's end. The amount of labor required to handle a plant of this class is not excessive, nor need it be of a highly skilled quality; speaking approximately, the labor required to operate 10,000-horsepower installation with recovery process will amount to $40 or $50 per day of 24 hours, exclusive of any attendance for gas engines.

Mr. Ellis: In the Gary mills most of the drive will be motors. In the rail mill they have several 6,000-horsepower motors and three or four 2,400-horsepower motors, some of 600 horsepower and numerous others of all sizes. The universal mill at South Chicago has been running successfully since about August, and it shows the advantage of the motors over the reciprocating engine, in that there is freedom from shock. That 2,500-horsepower motor reverses in something like three-tenths of a second, as near as I could time it with a split-second watch, and it reverses from full speed to full speed in four seconds. There is a very large flywheel running continuously in one direction at about 120 revolutions a minute.

ONLY HALF IN JEST.

Mr. H. E. Niesz of the Commonwealth Edison Company made a burlesque speech at the smoker of the Electric Club of Chicago on June 26th which was cleverly conceived and executed and which elicited much applause. The principal feature of the evening's entertainment, as related elsewhere, consisted in the farcical sale of a municipal electric-light plant to the town of Englewater. The various salesmen appeared before the mayor and councilmen, and their fanciful arguments and amusing antics were much appreciated. Mr. Niesz was present as the champion of the central-station interests, and he delivered his speech in mock-heroic style that elicited continual laughter. But, divested of the florid rhetoric thrown in for fun-making purposes, the argument was not without pith and force. Here it is:

"Your Honor, Gentlemen of the Council and Others:—I wish to present for your earnest consideration a proposition that will interest you, because it means a saving of thousands of dollars to this community. I come to convince you by plain statements of facts, not by flights of oratory, or the more sordid, and may I say even questionable, methods of some who have preceded me.

"You are the able and efficient, trusted and honored representatives of the people. You occupy your respective offices in the administrative and legislative branches of this great municipal government with credit and honor to your city, to your constituents and to yourselves.

"Upon you, honored gentlemen, devolves the great responsibility of directing the affairs of civic government, the preservation of law and order, the enhancement of public welfare, and last but not least the guardianship of the public exchequer and the expenditure of the money of the people. Let me admonish you in the exercise of this last and most important function of your honorable offices to give heed to the experiences of other municipalities not only in this country but in Europe, and do not follow the footsteps of error and wastefully squander the funds entrusted to your hands. Do not chase the rainbow of promise and the ethereal bags of gold that are held out as glittering rewards to those whose fleetness tempts them to try to reach the end of the rainbow before it has vanished into thin air and nothingness, leaving the weary chasers sore of foot, empty of hand and discouraged of heart.

"Mr. Mayor and honored councilmen, the municipal ownership and operation of public utilities is the rainbow of promise that has lured many a municipality into a race for glory and gain, the sad end of which is ignominy and defeat. The energy and enthusiasm, the brains and money expended in this vain struggle for a glorious municipal plant are frequently dissipated, and the final result is a pile of junk and disappointed hopes.

"Profit by the experience of your sister cities, who have yearned for the unattainable, who have wasted their substance on high-priced machinery, undreamed of political pay-rolls and interminable supplies. Why buy all these things you do not want? What you want is light, not machinery; saving of money, not extravagant expenditure; constant and efficient service, not haphazard operation. Gentlemen, I have the honor to offer you that constant and efficient worker, that tried and true patriot, that peerless leader, whose brilliant effulgence illuminates the world, whose power propels the nation, and whose unseen force permeates the entire universe—the modern-method central-station service."

IT HAPPENED NEAR PHILADELPHIA.

An incoming Willow Grove trolley car filled with passengers came to an abrupt halt near a clover pasture the other afternoon. An old blind horse, decrepit and shadowy in outline, stood on the road-bed and refused to budge. Impatiently the motorman clanged his gong, but the animal paid no heed to the warning. Instead, he cocked his ears and backed toward the front of the car, as though waiting to be hitched thereto. Annoyed to the exasperation point, the motorman grabbed his switch-bar and approached the horse in a threatening manner. Some of the male passengers intercepted him, however, and contrived to push the poor beast from the track by main force. "He wanted to commit suicide, the poor thing," was the theory of a sympathetic passenger. "I don't think so," said the conductor; "it is my opinion that that horse either did street-car service in his youthful days or is descended from an animal that did, and when he hears a car approach it is in the nature of a call to duty. This isn't the first time he has stopped this car by his peculiar conduct, as other crews have had the same experience with him."—From the Philadelphia Record.

BRITISH, AMERICAN AND GERMAN STANDARDS FOR ELECTRICAL APPARATUS.[1]

By J. S. Peck.

The engineering standards committee of Great Britain has recently issued a "Report on British Standards for Electrical Machinery." This report appears very incomplete, when compared with the standardization rules of the American Institute of Electrical Engineers and with those published by the German Technical Society, but it is really of a preliminary nature, and will undoubtedly be made more complete in the near future; in fact, tests are now being carried out at the National Physical Laboratory in London for the purpose of obtaining information regarding the effect of long-time application of high voltages to insulating materials, in order to guide the committee in determining the proper insulation tests to be applied to electrical machinery.

A comparison of the standard rules issued in Great Britain, Germany and America is of considerable interest, as showing the views of engineers in the different countries as to safe operating conditions. The temperatures, overloads and testing voltages called for in the standard specifications of the three different countries are given in Tables I., II. and III. The indicated temperature, instead of the rise in temperature, is given, as this is really the value which determines the rate of deterioration of the machine. In America and Great Britain the temperature rise is given above a room temperature of 25° C., while in Germany a room temperature of 25° degrees is permitted. This in itself adds 10 degrees to the allowable working temperature under German conditions.

Table I.—Maximum Operating Temperatures of Electrical Apparatus.

As specified by the engineering standards committee of Great Britain, the American Institute of Electrical Engineers and the Verband Deutscher Electrotechniker.

Part of Machine.	American.		British.		German.					
					Cotton.		Paper.		Mica.	
	T*	R†	T*	R†	T*	R†	T*	R†	T*	R†
Windings—stationary..	75	75	...	85	....	95	....	105	.....	125
Windings—moving.....	75	75	75	85	85	...	95	...	115	...
Com'tators and brushes	80	...	...	...	.....	...	.....	...	95	...
Collector rings.........	90	...	...	...	85	...	95	...	115	...
Bearings.............	65	...	...	...	.....	...	.....	...	.....	...
Squirrel-cage rotors....	80	...	...	...	85+	...	105+	...	125+	...
Transformers...........	75	75	75	75	95	...	105	...	125	...
Railway motors—										
Continuous rating....	100	125	...	...	.....	...	.....	...	.....	..
One hour rating.......	...	...	...	...	105	105	115	115	135	135

To obtain temperature rises, subtract 25 degrees from American and British temperature and 35 degrees from German temperature. T* stands for thermometer readings, R† for increase in resistance readings. All temperatures in degrees C.

Table II.—Overload Requirements.

	American.	German.
Generators.........	25 per cent for 2 hrs.	25 per cent for ½ hr.
Motors	25 per cent for 2 hrs. 50 per cent for 1 min.	25 per cent for ½ hr. 40 per cent for 3 min.
Rotary converters.	25 per cent for 2 hrs. 50 per cent for 30 min.	25 per cent for 30 min. 40 per cent for 3 min.
Transformers......	25 per cent for 2 hrs.	40 per cent for 3 min.

In the German rules different temperature rises are permitted for different classes of insulation. Cotton insulation demands the lowest temperature, paper insulation comes next, with about 10 degrees higher rise, while mica, asbestos and similar insulating material is permitted a temperature about 30 degrees higher than is allowed for cotton insulation. In the British and American standards it is stated that where special heat-resisting insulating material is used, higher temperatures may

Table III.—Insulation Tests.

	American.	German.
Minimum testing voltage	1,000 for one min.	100 for 30 minutes.
Apparatus for voltages between 5,000 and 10 000	Double for one min.	Normal + 5,000 for 30 minutes.
Apparatus for voltages over 10,000...........	Double for one min.	Normal + 50 per cent for 30 min.

be allowed than with the ordinary insulating material, but no limits are given. This distinction in permissible temperature rise for machines insulated with different kinds of material seems a step in the right direction, for there is no reason why a machine insulated with asbestos and mica throughout should be operated at as low a temperature as a machine insulated with cotton and similar perishable material. The great danger in this classification appears to be in the opportunity it offers for fraud, on account of the inability of the customer to determine whether all of the insulation in a machine is really of a fireproof nature or not. Everyone familiar with the insulation of electrical apparatus knows that many of the so-called fireproof insulating materials are anything but fireproof, and while it is not likely that responsible manufacturing companies who have had wide experience with different classes of insulating materials will put out apparatus which will not give a reasonable life, there is the possibility that manufacturing companies with less experience may be tempted to operate at higher temperatures than the insulating materials will stand. It is not probable that any conservative British or American engineer would ever accept electrical apparatus operating at a temperature of 125 degrees regardless of the class of insulation employed, and it is doubtful whether many German engineers would accept such machines. Nevertheless, this temperature is permitted by the German rules with certain classes of insulating material.

In general, it may be stated that the American standards are much more conservative than the German, while the British standards come somewhere between the two, but are nearer to the American than to the German. In Europe, the keenness of the competition in the sale of electrical machinery has made it necessary for manufacturers to take advantage of every possible means for reducing the cost of their apparatus. Increasing the temperature limit, which is equivalent to decreasing the cost per kilowatt, is one of the easiest methods of increasing output. To secure safe working at higher temperature, the German manufacturers have been studying the use of non-combustible materials. This study has also been carried on extensively in America, but American manufacturers have shown a tendency to retain the low temperature limits, thus giving their customers the benefit of the improved insulation, in that they obtain machinery having longer life and greater immunity from breakdown.

British and American electrical manufacturing companies know how difficult it is to compete in price with the German manufacturers. Perhaps the more liberal standards under which the Germans work are in part responsible for this. In any event, the tables here given will repay careful study on the part of British and American engineers.

Commenting on the foregoing, Mr. P. M. Lincoln (who, like Mr. Peck, the author of the article, is connected with the Westinghouse interests) says:

"It has long been recognized that electrical generating apparatus as designed and built by American manufacturers has more margin than apparatus of a similar rating designed and built by foreign makers. In other words, a 1,000-kilowatt generator is a considerably larger machine in the United States than it is in Germany. This difference is even greater than is indicated by the comparative tables given by Mr. Peck, for the reason that the overload capacities demanded by the American purchasing public are considerably in excess of those necessary to conform to the standardization rules of the American Institute of Electrical Engineers.

"For instance, the American Institute rules call for 25 per cent. overload for two hours on generators, and at this increased load allow 15° C. temperature rise in excess of that allowed at full load. On the other hand, American manufacturers have, in the past, been producing, and the purchasing public demanding, generators designed to meet specifications calling for 25 per cent. overload continuously with 10° C. temperature rise in excess of the full-load temperature and 50 per cent. overload for one to two hours with 20° C. rise in excess of that at full load. This latter condition may be compared directly with the German 40 per cent. overload for three minutes without any temperature guarantee.

"It is unfortunate that the American purchaser has been educated to demand generators conforming to the above-mentioned overload guarantee, since the excess in temperature over full-load conditions thereby allowed is far from logical. A generator which meets the 50 per cent. overload conditions will usually have 10 degrees, and in some cases as much as 20 degrees, to spare at full load. The American Institute requirement is much more logical in this respect. The 15 degrees excess temperature rise allowed for a two-hour 25 per cent. overload is, within limits, what may be expected in practice with a logically rated machine.

"In respect to overloads, the American Institute rule is superior to the German, since the American rule fixes the excess temperature for a specified overload during a specified time. The German rule, on the other hand, does not fix any excess temperature for the specified overload. In fact, it definitely states that the overload tests must not follow a full-load test in order to avoid overheating.

"Of the three methods of rating, the German goes to the extreme in one direction; that is, the rating given to the generator is the highest the machine can stand. The usual American practice goes to the extreme in the other direction in that a generator receives a rating which is considerably below the logical rating. The requirements of the American Institute standardization rules lie between the two and give to a machine a rational rating as well as provide a reasonable overload capacity, which is limited to a reasonable temperature rise.

"Speed the day when the American public will be educated to the point where they are willing to accept the reasonable and logical method of rating generators laid down by the standardization rules of the American Institute of Electrical Engineers."

1. From the Electric Journal of Pittsburg.

EFFECT OF TREATED TIES ON ELECTRICAL APPLIANCES USED IN SIGNAL SERVICE.[1]

By S. M. Rowe.

The question of the effect of zinc-treated ties on the electrical appliances used in the block or general signal service of railroads has just been called to the writer's attention, and in such manner as to indicate that in some cases this has been found serious, and, believing it to be important that the facts be known, he has deemed it best to correspond with the signal officers of the various lines, addressing an inquiry to each. The reason that it applied more particularly to the treatment of railroad ties seemed to justify the writer in doing this. The inquiry has met with quite free and cheerful responses, and the data obtained are therefore placed before the members of the association for general information and to encourage further study of the matter.

The writer takes this means of thanking those who have contributed information for their ready response.

Chicago and Northwestern Railway.—We have put in a large number of ties which have been through the zinc-chloride treatment, and our experience indicates that if a track section were completely renewed with ties having this treatment it would be impossible to operate a section over 1,200 feet in length. If, however, the ordinary renewals are made each year, that is, 12 to 15 per cent. of the total number of ties in a section, there is very little trouble. These ties act as condensers, but even this does not interfere with the circuits.

The worst trouble with ties having this treatment is in hot or dry weather, whereas in cool, wet weather the effect of the treatment is practically nil. After the ties have been in the track about one year, the effect of ties on circuits seems to disappear, so that if the ties in a track are renewed in the ordinary manner they may be in a few years entirely renewed without bad results to the signals.

Illinois Central Railroad.—Regarding the use of red-oak treated ties in territory equipped with automatic block signals: In 1904 and 1905 we completed a piece of second-track construction, in which all the ties were red oak treated with the zinc-chloride process, and we found on installing the automatic block service that the track circuits were entirely too long for this class of ties, and we were obliged to reduce them about 50 per cent. in length. It was our observation, however, that the conditions that required this reduced length of circuit had been eliminated as the ties became more seasoned, and it is not our impression that we would meet with any difficulty in maintaining the longer track sections, even in track that was entirely laid with zinc-chloride-treated ties, where the track had been laid long enough so that the ties were being renewed at the rate of three or four hundred per mile per year.

We developed, by investigation, that we would experience no more trouble with a track of this kind than with a track laid with white-oak ties, where freshly laid zinc-chloride ties do not exceed 25 per cent. of the total.

In regard to the effect of creosoted ties on block signals, our experience is so limited as to be of little value. Our signal people claim that they observed last year on some track laid with rock ballast, and in which some creosoted ties had been placed, that there was some disturbance of signal circuits, and some reduction in the length of the circuit had to be made. However, the piece of track in question was in rather bad shape for ties, a very large number being put in, and the condition was not a normal one.

It seems possible, however, that we may find some difficulty in maintaining track laid exclusively with creosoted ties, but this we can tell very little about at this time.

Delaware, Lackawanna and Western.—In reference to difficulties in our work in the signal system from treated ties, creosoted or otherwise—at the

1. Presented to the American Railway Engineering and Maintenance of Way Association at Chicago, March 19, 1908.

present time we have very few creosoted ties in service. These are at points where our track circuits are very short, and we have therefore experienced no difficulty in working our signals properly. We have had some difficulty in working long track circuits, say, one mile in length, where green, untreated ties have been laid, but trouble of this kind has been of short duration. We have, however, had no end of trouble on account of refrigerator cars dropping salt brine on the ties, which in turn formed a good conductor, conveying current from one rail to another instead of going back to relay, causing the relay to remain open, holding the signal in the danger position.

Atchison, Topeka and Santa Fe.—About the only reliable case we had was one with a long track section, where a large number of zinc-treated ties had been introduced at one time. We could not get current enough to the far end of the section to work the relay. It was easy enough to straighten this out by cutting the section, but we wanted to find out a little more about the matter, therefore made some tests to ascertain whether we could not work the same section with some rearrangement of the batteries. In making this test we discovered that there was a developed current in the section somewhere, and in testing for it found that this current was developed by the application of our own battery. The current disappeared finally after a certain discharge and could only be developed by one polarity. The last test made was to use the last polarity for the development of the current, and after taking a reading reversing the current quickly to see what the effect would be, we found that an application of reversed current would immediately neutralize the current which we had already developed.

We were not able to continue the tests because the circuit was in service and had to be kept working, but our deductions were that we had constructed a crude kind of storage battery by the use of treated ties in connection with our tie-plates, spikes and rails. In order to do away with this trouble, as far as possible, we have arranged to cut our western sections down to half a mile, and believe this will take care of all conditions unless a whole half-mile section happens to be renewed at one time.

Great Northern Railway.—We have been through one severe experience with track-circuit trouble, where a new line was laid on ties which had been treated to the zinc-chloride process.

When we first set up our batteries on this work it was found that the current from same was almost wholly lost at a distance of from 1,000 to 1,500 feet. This was due to the zinc in the ties serving as a conductor, which for a time caused a decided tendency toward short-circuiting and grounding of the current passing through the rails.

In the course of seven or eight days from the time batteries were connected to the rails, it was noticed that an improvement had set in, and gradually from that time on the treated ties gave less and less trouble, until practically all ill effects from their use disappeared. If a similar case presented itself now, we would arrange to connect the track batteries with the rails not less than 30 days prior to the signal system going into service, thus allowing the batteries to insulate the spikes from the ties, which is the effect produced by the small electric current passing from the rails to the ties through the spikes.

It is our judgment that the zinc-treated ties used for ordinary yearly tie renewals will not cause any track-circuit trouble. The length of the track-circuit sections, of course, has a bearing on the subject. It is good practice to limit the length of track sections to 3,000 feet, even though non-treated ties are used.

We do not know that the creosoted tie has caused any trouble in this direction.

STORAGE-BATTERY INDICATOR.

A simple little device that is worthy of the careful inspection of any user of storage batteries, whether the cells be employed in automobile or stationary service, is illustrated by the accompanying cut. This storage-battery "gauge," or, as its manufacturer, the General Accumulator and Battery Company of Milwaukee, Wis., calls it the "Radium" indicator, is essentially a novel form of weighted hydrometer or acidometer in which the counterbalance or weight is a small glass chain attached to the hydrometer proper. As the increase in the specific gravity of the electrolyte raises the hydrometer, its attached glass chain is lifted, link by link, from the bottom. As the specific gravity of the electrolyte lowers, the counterbalancing glass chain is deposited again on the bottom, link by link. An indicating pointer at the top of the hydrometer moving up and down past the face of the gauge gives always a positive indication as to whether the battery is "up" or "down," so to speak, in its condition.

This little indicator is supplied in conjunction with the "Radium" storage battery, manufactured by the company named, and its manufacturer guarantees the efficiency of the device to be correct within two per cent. of actual conditions.

STORAGE-BATTERY INDICATOR.

USE OF NITROGENOUS COMPOUNDS IN AGRICULTURE.

At the meeting of the Faraday Society in London on June 9, 1908, Dr. Albert Frank read a paper "On the Utilization of Atmospheric Nitrogen in the Production of Calcium Cyanamide, and Its Use in Agriculture and Chemistry."

The practical manufacture of calcium carbide in the electric furnace in 1894 by Willson and Moissan furnished Professor Frank and Dr. Caro with the ideal base required for fixing atmospheric nitrogen in the place of the metallic base which they had previously used (barium) in their experimental search for a commercial method of producing cyanide of potassium for the recovery of gold in mining. As a result of these researches the Cyanid Gesellschaft was founded, which has supplied such a large proportion of the cyanides used in gold extraction in South Africa, Australia and the United States. The researches also led to the production of calcium cyanamide (nitrolim), a genuine substitute for sulphate of ammonia and nitrate of soda for all agricultural purposes, and which can be produced in unlimited quantities wherever limestone, coal and air are available, containing up to 28 per cent. of nitrogen.

The only other practical method of fixing atmospheric nitrogen which has been perfected of recent years for similar uses to calcium cyanamide is known as lime saltpeter, and has been invented by Professor Birkeland of Christiania, but this process, though successful from the scientific point of view, requires considerably more expenditure of power than the Frank-Caro process, and the product possesses, for agricultural purposes, several drawbacks which calcium cyanamide does not. The latter can replace for all purposes sulphate of ammonia and for most purposes nitrate of soda, with the added advantage which neither of the others possesses of being alkaline instead of acid. It does not require any greater precautions in application than the other nitrogenous manures, and can, with certain precautions, become a useful constituent of mixed or complete manures, as has been determined by Dr. Hall's Rothamstead investigations. It is not so subject to being washed out of the upper soil by heavy rains as either of its predecessors, and its effect is more persistent. The lecturer illustrated this part of his lecture with lantern slides of the relative results of the nitrogenous manures, including cyanamide, on a variety of crops—wheat, barley, oats, turnips, beets, etc., all showing at least equality with the older and better known manures.

Calcium cyanamide by melting with certain fluxes yields pure cyanide of potassium or sodium, and in the form of "surrogate," which can readily be produced near most gold mines, is an efficient substitute for cyanide in the recovery of the precious metals. Ammonia can also be readily and inexpensively obtained from it. Concentrated into dicyandiamide, it is in increasing demand for the manufacture of organic dyes, and its future as a "deterrent" in the form of salts of guanadine to reduce the temperature of explosion in high explosives and prolong commensurately the life of the inner tube of big guns, is assured; it also does away with the flash accompanying explosion as well as with smoke. Mixed as a powder with other ingredients, calcium cyanamide tempers, hardens and cements steel in the most efficient way.

The author then proceeded to describe the practical features of the manufacture of nitrolim. The carbide is first ground to powder in air-tight mills, filled into furnaces which are kept full of nitrogen, and raised to and maintained at a temperature of 800° to 1,000° C. for several hours, then allowed to cool slowly, and finally reground into a fine slate-black powder, which is sent out to the farmer in paper-lined bags, containing from 57 to 63 per cent. of pure cyanamide or 20 to 22 per cent. of nitrogen with about 20 per cent. quicklime, 14 per cent. of carbon, and 7 to 8 per cent. of silex, iron oxide and alumina. To replace the present consumption of Chile nitrate by calcium cyanamide would require something like 800,000 horsepower, and works are springing up all over the world to produce it wherever waterpower is abundant and cheap. The first works established for producing and selling 3,000 to 4,000 tons a year, working for the last three years, were in Italy, at Piano d'Orte (Abruzzi), and are now being enlarged for an output of 10,000 tons. Another factory is just being erected at San Marcel (Val d'Aosta), for another 4,000 tons, and the great Terni Carbide Works are laying themselves out for the production of some 10,000 tons in the near future. Dalmatia has followed the Italian example at Sebenico, at Fiume (each for an initial 4,000 tons), and at Almissa, where 50,000 horsepower is available), and a further 10,000 tons output is being planned, all the product being required in the Balkans, Hungary and the Mediterranean coast of Africa, and Egypt.

France already possesses two works for an initial output of 4,000 tons; Switzerland one for 3,750 tons; Germany three works, with an initial output of 12,500 tons, and one in prospect in the Bavarian Alps for 15,000 tons. The United States Cyanamide Company is erecting a 5,000 to 6,000 tons works at Ontario, in Canada, to begin with, and another is to follow in Tennessee of much larger proportions. The central provinces of India are to be supplied from works on the Nerbuddah River, while the Japanese are erecting a works at the southern end of Kuiskzu Island for an initial 4,000 tons. The largest works, however, are due to British enterprise, and have just been completed at Odda, in Norway, for an initial output of 12,500 tons, with facilities for a prospective increase to 50,000. At the Odda works the largest Linde plant for obtaining nitrogen from the air ever designed has been erected. These works are supplied with carbide from the adjacent works of the well-known Alby United Carbide Factories Company, with an initial capacity of 34,000 tons, which can be readily expanded to four times that amount by calling further on the available waterpower at command, up to 80,000 horsepower. Slides illustrating the features of the several works mentioned were thrown on to the screen.

The author concluded by stating that by the end of the present year works for the production of 45,000 tons of nitrolim would be in full swing, but this would not sensibly affect the market for sulphate ammonia and nitrate of soda, as the demand for nitrogenous manures and products was increasing so rapidly, by over 15,000 tons of nitrogen a year in Germany alone. Both agriculture and the arts and industries seemed capable of absorbing untold quantities of nitrogen in ever-increasing amounts, and there was no sign of surfeit. In any case, owing to the perfecting of the manufacture of calcium cyanamide, the possibility of Sir William Crooks' pessimistic forecast coming true had become very remote, and mankind was no longer threatened with a shortage in their bread.

Diagrams were exhibited of the results obtained in comparative trials on various crops.

Mr. Henry Cottrell pointed out that a great advantage of these artificial nitrogenous manures is that they are alkaline, whereas the native nitrates are acid and produce in time sickness in the soil. It was difficult to persuade the farmer, however, to use new manures.

Mr. Walter Reid, referring to some tests he had made on calcium cyanamide, drew attention to the moisture in the soil as having considerable effect on the results of such tests. With regard to the use of calicum cyanamide in smokeless powder, he had found it rather too efficient in slowing the explosion.

Dr. H. Borns hoped the author would furnish some fuller details regarding the efficiency and construction of the electric furnaces in which combination of nitrogen with carbide took place.

Dr. J. H. Voelcker said farmers could not be expected to use new manures until they were perfectly satisfied as to their cost and effect. There were, for example, at present certain disadvantages connected with the use of nitrolim which would have to be eliminated before it could become entirely satisfactory Beyond that, the situation was determined entirely by price.

Mr. W. Murray Morrison asked whether the cyanamide could not be made direct from limestone and coal in one operation.

Mr. J. L. F. Vogel asked what fear there was of a charge of carbide not being completely nitrated.

The chairman drew attention to the use of cyanamide in synthesis, and hoped that some of the very interesting and important compounds that could be made from it would be manufactured in this country.

Dr. Frank replied to the points raised by the various speakers. Cyanamide was 10 per cent. cheaper than ammonium sulphate. Its stability was good; although the lime absorbed moisture, there was no loss of nitrogen. Up to the present its manufacture in one operation had not proved successful.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE.

Paris, June 16.—I have had occasion to refer several times to the project for the transmission of power from the River Rhone to Paris. The question has been occupying the attention of engineers for some time past. Mr. Blondel, a well-known electrical engineer of Paris and inventor of the oscillograph for showing wave forms of machines, has been engaged recently in developing a project of this kind, and he proposes the erection of a hydro-electric plant on French territory on the Rhone, not far from Geneva, and lying below the large waterpower station of Chèvres. One of the most interesting points about the project is that the engineer is planning a power line which is to work at 120,000 volts, which is much greater than the voltages in use at present. On the Continent the most recent power lines do not exceed 50,000 or 60,000 volts. The matter of insulating the line is of course the principal point, and a special type of porcelain insulator has already been designed for the purpose, based, it appears, upon recent American practice.

The electric railway which runs through the picturesque region from Fayet to Chamonix and Argentière has lately been completed by a new section which runs from the latter point to Chatelard and Martigny. The line is under the control of the Paris-Lyons-Mediterranean Railroad Company, and the new section will be put in operation during the first part of July.

In Austria there are a number of electric-railway and other electrical projects on foot. A concession for an electric road was granted not long since to a company which will build a line between Bruneck and Sand. It will be a standard-gauge line, and, according to the contract, it is to be finished within two years. The municipalities of Römerstadt, Friedland and Braunseifen expect to have an electric road running between these localities, and have already advertised for bids. Power will no doubt be secured from a hydro-electric plant which will be erected at Friedland. An electric automobile line has been opened not long since between Klosternenberg and Weidling, and it is now running very successfully. The automobiles are built to contain 20 passengers.

The French Thomson-Houston Company is drawing up the plans for a turbine plant to be located on the Vienne River, using about seven miles length of the stream for this purpose. The total head of water will be about 60 feet. The project calls for a plant of large size, and the pole lines will extend to a radius of 30 miles.

One of the largest systems of turbine plants in Italy for electrochemical work is that which is erected at the Pescaro Falls by the Electrochemical Company. There are a number of waterpower plants here which give a total of 35,000 horsepower. Some of the plants were built quite recently. This estimate of power includes also the reserve units of the stations. Most of the current is used in electrolytic works in the neighboring country, especially for carbonate of soda, chloride of lime and aluminum.

According to the Japanese press, there has been formed a company known as the Kinshin Electric Railway Company, capitalized at $1,000,000. This is a joint stock company, and is to construct a short electric railroad from Monji to Zutosaki, via Kokira and Yawara, a total length of 15 miles, together with a branch line running from Kokira and having six miles length.

The municipality of Marioupol, Russia, is considering a project for an electric-light and power system for that locality. A. DE C.

GREAT BRITAIN.

London, June 20.—The proceedings in connection with the London electric power bills before the House of Lords are now drawing to a close and a result may be looked for next week. During the last few days the existing companies have been expounding a counter proposal to the committee in opposition to that of the previous promoters to erect a large power house on the Thames similar to what has been put forward in previous years. The existing companies, on the other hand, ask to be allowed to utilize their six most modern generating stations, which are all on the river, and to treat these as bulk supply stations, from which energy would be sent to those existing power houses working under less favorable conditions. To this there would not appear to be any considerable opposition, but a further proposal of the bill is to create a joint committee, which, while not working any plant itself, is to be the controlling authority. This, again, as a principle is largely agreed with, but one of the fundamental difficulties of the problem is the rights of purchase which the various local authorities have. All these are swept away in favor of purchase by a central authority upon certain terms in 1932 or 1952, but the method of putting this into effect has allowed a loophole whereby any undertakings transferred to the joint committee will receive 20 years longer life of compensation for an extra life of that period, which they would not get under the existing conditions. This is where the controversial matter comes in. As I have said, many of the other authorities in the metropolis agree with the principle of a joint commission, but to endeavor to bring this into existence through the medium of a private bill, under which only a few undertakings may join, and to give these administrative powers over the remainder seems foredoomed to failure. Any such authority must be created by Parliament, and the supply authorities within the area decided upon must be compelled to come in. And it would not surprise me if this were the committee's recommendation.

The Manchester corporation has decided to install a new 6,000-kilowatt turbo-alternator, the turbine being of the Zoelly type. This will be the largest machine of its kind in operation here.

A new electric monorail system has recently been demonstrated in London. This is the invention of a Mr. Kearney. By it the cars are gripped top and bottom by a single line of wheels engaging on two rails, one vertically above the other, above and below the car, and it is asserted that by this method derailment is physically impossible unless an actual breakage of the permanent way takes place.

A couple of engineering details of some interest came out this week in the evidence upon the London electric power bills. One is that should the companies bill be passed it is the intention to install gas-driven generators for the day load. The other is that one of the London companies has installed experimentally an oil-driven set, the total works costs of which, including capital charges, are as low as 0.39d. per unit.

Owing to threat to apply for an injunction against nuisance by vibration from the generating station, the Colchester corporation is seriously considering the advisability of erecting a new power house on a more isolated spot. A short time ago there were quite a number of actions in respect to vibration from power houses in London and elsewhere, some astute property holders having become acquainted with the fact that although sanctioned by Parliament, the authorities were still liable for nuisance at the common law. Consequently some properties changed hands at inflated prices, because the supply authorities were in the anomalous position of being bound to maintain the supply and yet not to create vibration or other nuisance, a practically impossible proposition when carried to extremes. Since then, however, many authorities have secured parliamentary powers, which have exempted them from actions at the common law under this head. G.

NEW ENGLAND.

Boston, June 27.—The decree of the Massachusetts Supreme Court in the famous New Haven trolley merger case was entered on June 23d. The New York, New Haven and Hartford Railroad Company, according to the decree, is enjoined from taking or subscribing for the stock of the Worcester and Southbridge, Worcester and Blackstone Valley, Worcester and Dudley, Worcester and Webster, Springfield or Berkshire street-railway companies; also from assuming or exercising the franchise or privilege of holding directly or indirectly the stock of either of these companies after July 1, 1909.

The Marblehead car barns of the Boston and Northern street railway were destroyed by fire on June 22d, the estimated loss being $15,000. Plans for rebuilding on a larger scale are under consideration.

Rails have been laid in the new Washington Street tunnel in this city and construction trains are now using the tracks daily while the finishing touches are being given to the work. Escalators have also been installed in addition to stairways at the deep stations, and the tunnel will soon be ready for regular train service. B.

NEW YORK.

New York City, June 27.—The Public Service Commission on Thursday refused to grant the application of the Long Acre Electric Light and Power Company for permission to issue $60,000,000 in securities. According to the evidence given at a series of hearings the company wanted the money to refund outstanding indebtedness and to build a plant with which to compete with the New York Edison Company and its allied companies. Some very interesting remarks are contained in the commission's decision, as may be noted below: "If a competing company were allowed to begin operation it is not likely that it would continue to operate independently for any considerable period. Competition would cause inconvenience and expense to the public; would cause duplication of plant; would lead to waste, and ultimately be urged as a reason why rates should not be reduced to consumers. Practically all of the advantages claimed by the applicant as the probable results of competition can be secured through the powers of this commission, and until it has been demonstrated that these are ineffective it would be unwise to adopt a method which has proved to be ineffective in the past."

Consumers of electric current in this city will no longer be forced to sign a contract with the companies for a year, but will be able to discontinue the use of electricity if they wish it at three days' notice. Some of the companies have also agreed to waive that clause in the contracts which makes it incumbent on the consumers to pay a certain amount every month whether they have actually used any electricity or not. These changes have been made by the electric-light companies as the result of the investigation which has been carried on by the Public Service Commission into the general situation. No order was issued by that board, but the companies voluntarily accepted the commission's ideas.

Official announcement has been made by the Long Island Railroad Company that within 18 months all of the big undertakings in connection with the great system of tunnels and union stations connecting the Pennsylvania and the Long Island systems will be completed. All lines will converge at Jamaica. Curves are to be eliminated, and there is to be a straight low-grade high-speed electric road between the big terminal in Manhattan and the new central station to be built at Jamaica. The Maple Grove straightening will save a mile in distance, and it is already figured that the time will be cut to 15 minutes, perhaps to 12. All grade crossings are to be eliminated, and a big transfer terminal station with 17 through tracks is to be erected in Jamaica to handle the traffic.

As a result of an action in chancery against the Consolidated Lighting and Refrigerating Company, a $22,000,000 concern with offices at No. 5 Nassau Street, Vice-chancellor Howell, in Newark, N. J., on Monday appointed Randolph C. Barrett of Newark as temporary receiver. The receiver at once took possession of the assets of the company, consisting chiefly of shares of the Consolidated Railway, Electric Lighting and Equipment Company, capitalized at $16,300,000, and the Railway and Stationary Refrigerating Company, with a capital of approximately $6,167,000. The petition alleged that the two subsidiary companies are largely in the experimental stage and have not been able to pay a dividend.

To add to the comfort of seat-holders in the family and dress circles, the directors of the Metropolitan Opera Company have ordered the installation of two new and exceptionally large electric elevators on the Fortieth Street side of the opera house. W.

MICHIGAN.

Detroit, June 27.—The Michigan Power Company of Lansing has made arrangements to extend its lines to Diamonddale for furnishing light and power. The extension will be made immediately.

The Michigan United Railroad, whose headquarters are at Jackson, has increased its capital stock from $5,000,000 to $7,000,000. The Michigan United Railroad recently sold its preferred stock to an English syndicate, and the money realized from the increased capitalization will be used in extending and improving the lines. The line from Lansing to Jackson will be started at once.

The Detroit, Flint and Saginaw electric railway was sold to Isaac Applebaum of Detroit, in accordance with the order of Circuit Judge Wisner. The property was bid in at $50,000. Mr. Applebaum holds bonds to the amount of $50,000, and it is said that he will complete the construction of the road to Flint. Only 14 miles are in operation. The Detroit Trust Company has been appointed receiver for the road. D.

INDIANA.

Indianapolis, June 27.—At a meeting of citizens of Rockport, Cannelton, Tell City and Troy, and the officials of the Evansville and Eastern Traction Company at Evansville, on June 23d, arrangements were made for the construction of the extension of the company's line to connect the cities named.

The Indiana Union Traction Company is installing a block-signal system on the Muncie-Indianapolis division, which, when put in operation, will give the train dispatcher direct communication with any car on the line, and thus prevent accidents.

The Chicago, Lake Shore and South Bend Traction Company has completed the laying of its track, to and within South Bend, and service between South Bend and Michigan City will be begun on July 1st. Before the end of July cars may be running into Chicago over the tracks of the Illinois Central.

A co-operative company, known as the Bluffton, Berne and Celina Traction Company, has been organized, and the line which it proposes to build between Bluffton and Celina is now being surveyed. The line penetrates virgin territory, with no parallel roads, steam or trolley. The line when built will connect at both ends with excellent trolley systems.

The United States Steel Corporation has purchased 361 acres of stone land in Monroe County and will build and equip thereon a plant worth $1,500,000, for the purpose of preparing stone for the steel mills at Gary. Stone-crushing mills, machine shops and an electric-light plant will be erected and equipped on the property. S. S.

ILLINOIS.

Peoria, June 27.—A corps of surveyors is at work surveying the Kankakee-Champaign electric railway. In some of the towns that the line will pass through the company has secured the franchises, and much of the right-of-way has been secured, but in no case has the company paid more than $125 an acre for the land. In cases where the owners refuse to accept the price offered, condemnation proceedings will be started.

The Illinois Traction Company is planning to place arc lights in its stations in all the principal stations on the system. Many of the towns that it serves have no lighting plants, and the station lights will be of advantage both to the company and the passengers that use these stations.

The Springfield, Clear Lake and Rochester Railway Company sold the first tickets from Rochester to Springfield this week. While the line is not fully completed, the company has commenced the handling of passengers.

General Manager L. E. Fischer of the Illinois Traction Company, together with General Traffic Manager B. R. Stephens and General Superintendent of Transportation C. F. Handshy, are planning a limited electric-railway service between the cities of Peoria and Springfield and Springfield and Bloomington. The present intention is to make a two-hour schedule between the cities, alternating between the cities of Bloomington and Peoria and Springfield and Bloomington. The intention is to place the schedule in operation about the 15th of July.

The majority of the right-of-way for the proposed electric railway between Whitehall and Pana has been secured. According to W. C. Staples, the construction work will begin soon, and the stretch between Whitehall and Girard will be completed by fall. This line will be 37 miles long, and is an air line, touching only three towns—Whitehall, Palmyra and Girard. The Prairie State Traction Company was organized two years ago with the following-named officers: President, H. C. Morrow; vice-president, Scott Setter, and secretary, H. O. Tunison.

A committee from the town of Maquon was taken over the plant of the Elmwood Electric Light Company by the president, E. L. Brown of Elmwood. The committee was from the City Council and was on a tour of inspection, as the Council will extend the street-lighting system in Maquon soon, and the Elmwood company is now furnising it with some street lights, and hopes to secure the remainder of the contract. V. N.

NORTHWESTERN STATES.

Minneapolis, Minn., June 27.—The Wausau (Wis.) Street Railway Company has ordered an 1,800-horsepower turbine wheel and generator of the Allis-Chalmers Company of Milwaukee.

The Prescott Light & Power Company of Prescott, Wis., has been incorporated by H. F. Mercord and Nicholas and Benjamin Kohl for $30,000, to take over the present lighting plant of H. F. Mercord. It will also operate the plant now being installed in Clifton.

The petition of the Hill City Electric Power Company of Rapid City, S. D., for a water right on Spring Creek, has been allowed by State Engineer Samuel H. Lea.

The Black Hills Traction Company of Spearfish, S. D., has awarded a contract to Young & Smith of Belle Fourche to construct a canal to furnish power for an electric power plant at Beulah, Wyo., at a cost of about $100,000.

The Mitchell Power Company of Mitchell, S. D., will shortly commence work on a new electric-light and gas plant which it will erect on three acres of land it has purchased just outside the residence district.

Work on the dam at Dayton Hollow, which will furnish electric power for Wahpeton, N. D., is progressing rapidly, and it is expected to have the plant completed by September.

The pumps at the water works at Minot, N. D., will be run by electric power to be furnished by the Minot Light and Telephone Company.

There is a movement on foot to construct an electric road between Vineland and Onamia, Minn., in order to connect with the new Soo line.

The Minneapolis Electric Company may appeal to the courts to overrule the act of the City Council in rescinding its franchises.

Unless the electric lighting company at Albert Lea, Minn., furnishes better service it is proposed to have the city acquire a plant of its own.

A telephone company has been organized at Lake Mills, Iowa, with Ole Grove as president.

F. M. Chandler, manager of the Montgomery County Telephone Company of Villisca, Iowa, has resigned to accept the position of manager of the Iowa Telephone Company at Iowa Falls.

The Home Telephone Company of Oskaloosa, Iowa, has awarded contracts for over $30,000 worth of work. John D. McKey will erect a new building for the company at a cost of $10,000. A $20,000 multiple switchboard, with an ultimate capacity of 6,400 subscribers, has been ordered from the Dean Electric Company of Elyria, Ohio. The work of placing wires underground will begin about July 15th.

The Home Telephone Company will expend $50,000 in improving the service at Ottumwa, Iowa.

The local telephone company at Story City, Iowa, is getting ready to place its wires underground and expects to have the work finished by September 1st.

The Duluth Telephone Company of Duluth, Minn., will spend close to $50,000 in removing its overhead wires and poles. R.

PACIFIC SLOPE.

San Francisco, June 24.—The Tuolumne Water Power Company, with the intention of extending electric transmission lines from Tuolumne County to San Francisco, has brought suits in Oakland, Cal., to condemn rights-of-way across property near Mission San Jose, owned by William Eagan and others.

The City Council of Santa Cruz has passed an ordinance providing money for an increase in the capacity of the water system and an electric-lighting plant.

The Nevada Gas and Electric Company is the name of a corporation, which a promoter, said to represent Pittsburg and Chicago capital, says will soon begin the construction of electric power plants on the Truckee and Carson rivers in the state of Nevada.

A wireless-telegraph plant for the new government station at Valdez, Alaska, is to be built by the Department of Electrical Equipment at the Mare Island navy yard. A.

PERSONAL.

Captain E. L. Hiller, city electrician of Lynn, Mass., for 16 years, died on June 26th. He was a civil war veteran.

Mr. W. J. Wilgus, who figured prominently in the electrifying of the New York Central lines in New York, has been elected president of the Amsterdam corporation, which was formed for handling large engineering contracts and railway problems connected therewith. The vice-president of the company is Mr. H. J. Pierce of Buffalo, president of the International Railway. The headquarters are in New York.

Mr. William A. Carson of Columbus, Ind., has resigned the position of assistant general manager of the Indianapolis, Columbus and Southern Traction Company to accept the position of general manager of the Evansville Electric Railway Company, which operates a combined steam and electric system between Mount Vernon, Evansville and Rockport, Ind. Mr. L. M. Brown will succeed to the position vacated by Mr. Carson.

ELECTRIC LIGHTING.

The Commonwealth Edison Company is arranging to meet the terms of its new ordinance by putting into effect a reduced rate for current to small users. The new rate will be effective August 1st and is a reduction of nearly 15 per cent.

Reports from Rock Island, Ill., say that a number of men experienced in the business are planning a large electric power plant, and possibly a gas plant, to be constructed in Rock Island to compete with the Tri-City company in Rock Island, Moline and Davenport.

The Kansas City Railway and Light Company has just sold $800,000 first-lien refunding five per cent. bonds, which will be used to retire floating indebtedness. The bonds have been held in the treasury pending a favorable market. The company controls all the street-railway, electric-light and power business in Kansas City, Mo., and Kansas City, Kan., serving a population of over 400,000.

In the city of Edgeley, N. D., the city water supply is from an artesian well. Not until the well caught fire were the citizens aware that it contained large quantities of high-grade natural gas. The gas, which cost the city practically nothing, will now be used as fuel in the electric-light plant, and the city expects to attract manufacturing and industrial enterprises by reason of the cheap power thus afforded.

ELECTRIC RAILWAYS.

Interests represented by E. J. Lander have been granted a franchise for a street railway in Grand Forks, N. D.

The Washington, Baltimore & Annapolis Electric Railway Company has decided to establish a new department to be known as the publicity department, and has chosen George H. Gall, of the Washington Times reportorial staff, as its head.

The Denver and Interurban electric railway was put in regular operation between Denver and Boulder, Colo., on June 23d. Efforts are being made to have everything in first-class order for the national Democratic convention. The cars are supplied by the St. Louis Car Company.

The Aurora, Elgin and Chicago electric railway for May shows an increase, both in gross and net earnings, compared with May, 1907. For 11 months the gross was $1,275,515, a gain of $80,439, compared with 1907; net earnings were $571,236, an increase of $27,985, and surplus earnings, $265,091, an increase of $13,291.

The Kansas City, Ozark and Southern electric railway is completing plans for building its road from Mansfield, Mo., to Ava, the preliminary survey for which was made last December. The town of Ava has raised a bonus of $30,000 for the road and the building of the main offices and repair shops at that point.

In accordance with a bill passed by Congress at the last session, the Interstate Commerce Commission has taken up the problem of supervising the service of street railways in the District of Columbia. The burden of work may be placed on one of the three commissioners, but the whole commission will act on important questions.

The latest efforts at consolidation of the elevated railroads in Chicago are said to be backed by Herbert Miles of Armour & Co. These negotiations are independent of those recently attributed to Mr. Samuel Insull, president of the Commonwealth Edison Company. No more success in bringing together the conflicting interests has been met with.

A final decree restraining the New York, New Haven and Hartford Railroad Company from holding any stock in the various trolley companies named in the information recently filed against the New Haven company by Attorney-general Dana Malone, was handed down by Judge Rugg in the Supreme Court on June 23d. The decree gives the company until July 1, 1909, to dispose of its present holdings in these companies.

Receivers have been appointed for the Chicago Consolidated Traction Company, David B. Forgan and John M. Roach, the latter president of the Chicago Railways Company, being named. The Chicago Railways Company as the successor of the old Union Traction Company owns the stock of the Consolidated company, and the two corporations will continue to be operated as one. It is probable that the Chicago Railways Company will be the only bidder for the property at foreclosure sale, and the price it offers will determine the amount to be distributed among bondholders. The companies which formed the Consolidated company were the Chicago North Shore Street Railway, Chicago Electric Transit, North Side Electric, Ogden Street Railway, Chicago and Jefferson Urban Transit, Cicero and Proviso, Evanston Electric and the North Chicago Electric.

POWER TRANSMISSION.

The Union Electric Power Company of St. Cloud, Minn., has been incorporated with a capital of $100,000. A. G. Whitney is among those interested.

P. H. McLaughlin and associates are planning the establishment of a large electric power plant near Fairview, Nev. The project is said to involve an expenditure of $700,000.

An investigation into the recent controversy between the Sanitary District and the City of Chicago over the right to use the city's poles and conduits and to build new pole lines has been concluded by the Citizens' Association of Chicago, and an exhaustive report on the merits of each side is about to be printed. It is said that this report will score the city officials for their seeming opposition to the disposal of the District's surplus electric power from the Lockport plant. If the District is unhampered in the future in its efforts to sell all its surplus power, the net income from this source is placed at $500,000 a year. This is based on the full output attainable from the Lockport plant within the next six months.

A force of 1,000 men will resume the construction work of the Eastern Colorado Power Company at Boulder, Colo., within a few weeks, according to an announcement made by Curtis & Hine, engineers in charge of the project. The Boulder plant is to supply the northern part of the state with electrical power and is to have a 5,000-horsepower delivery. Work on the enterprise has been suspended since the financial flurry last fall. The plant at Glenwood Springs, which is being built by the Central Colorado Power Company, is now employing between 700 and 800 men. It will be completed by October 1st and will furnish power to almost the entire western part of the state. These two big systems are then to be linked together, forming a project with the ability to supply practically the entire state.

TELEPHONE.

The People's Mutual Telephone Company has been granted the use of the streets of Garden City, Kan.

The Long-distance Independent Telephone Company of Omaha, Neb., has been incorporated with a capital stock of $10,000.

The Point of Rocks Telephone Company of Custer, S. D., has been incorporated with a capital stock of $25,000.

The Holden (Mo.) Home Telephone Company has been incorporated with a capital stock of $50,000.

At a meeting recently held at Napinka, Manitoba, it was decided to construct a telephone system at a cost of about $35,000, with switchboards at Napinka, Goodlands, Wascada and Medora. Reeve Innis of Napinka is interested.

The Interstate Telephone and Telegraph Company of Aurora, Ill., is rebuilding many of its lines. The Harmon and Dixon lines have been renewed and a force of men is putting in a new line to Morrison, where the whole exchange is to be overhauled and rebuilt. When Morrison is completed work will be done on the Prophetstown and Coleta lines. The whole territory will be gone over and the telephone system remodeled and repaired.

Plans have been made for the construction of a number of new toll lines in the southwestern part of Wisconsin by the Wisconsin Telephone Company. These will connect Waukesha, Eagle and the Lake Geneva section with the new underground lines between Milwaukee and Chicago at Racine. A trip of inspection was made recently by President Alonzo Burt, General Manager H. O. Seymour, Chief Engineer W. B. McGovern and Superintendent of Construction J. P. Brennan.

Activity in the telephone department of the Chicago Subway Company, which operates the freight tunnels under downtown Chicago, is expected within the next few months. The company, under terms of its franchise, must install a telephone service with not less than 20,000 bona fide subscribers before February 1, 1909. It is now said to have about 6,000 telephones in operation on its automatic system, and with seven months in which to comply with the terms of its ordinance it is expected that some very hard work will have to be done. No definite plan has yet been announced as to how the telephone plant will be developed, whether by the Subway company or by an independent corporation.

By a decree filed in the branch Appellate Court on June 30th the recent decision returning control of the Kellogg Switchboard and Supply Company to its former controlling owner, Milo G. Kellogg, was reversed and the case remanded to the Circuit Court with directions to enter a decree similar to that granted in the case of the United States vs. the Northern Securities Company, which was affirmed by the United States Supreme Court. The Appellate Court finds that the complainants have failed to prove that the old board of directors, composed of those who obtained control of the stock when it passed from the hands of Milo G. Kellogg, was superseded and ousted by the election of the Kellogg board, and that the decree declaring the latter board elected is erroneous. This decision apparently places the American Telephone and Telegraph Company again in control of this property.

The province of Saskatchewan has completed arrangements for its plan of government-owned telephones, but as yet no deal has been made with the Bell company for the purchase of its small mileage in that province. The new department has been fully organized, with Hon. J. A. Calder as minister of telephones, telegraphs and railways. James Sutherland of Winnipeg, Man., superintendent of traffic of the Manitoba government telephones, has been appointed superintendent of construction work.

PUBLICATIONS.

A dummy firecracker adorns the July calendar card of the F. Bissell Company of Toledo. "It can't possibly hurt you," says the card, "nor would it be contrary to law to give us an order." This card will be mailed to anyone on request.

The H. Krantz Manufacturing Company, 160 Seventh Street, Brooklyn, N. Y., issues leaflets illustrating switchboards built for the Metropolitan Life Insurance Building, Hotel St. Regis and John Wanamaker's store in New York city. It also calls attention to its adjustable floor boxes.

The Central Electric Company, Chicago is distributing its new catalogue on malleable-iron specialties, such as anchors, feeder arms, pins, cross-arms, bolts, wall brackets, etc. The catalogue includes the report of tests made by Columbia University of New York city on the malleable-iron cross-arm bolt to ascertain the load required to strip or destroy the bolt threads.

"Helps—Don'ts for All Who Grind" is the title of a little booklet helpful to persons interested in abrasive materials just published by the Norton Company of Worcester, Mass. Points particularly covered are on the selection of the wheel and its mounting, truing and speed. The suggestions offered are applicable to various abrasives as well as to "Alundum" used in the Norton wheels.

The United States Coast and Geodetic Survey has recently published appendix No. 5 to its report for 1907. This new 76-page section gives the results of magnetic observations made by the Coast and Geodetic Survey between July 1, 1906, and June 30, 1907, and was prepared by R. L. Faris, chief of the division of terrestrial magnetism. The work of the year was distributed over 37 states and territories, but was principally carried on in the West and Northwest, where comparatively few observations had been made previously.

The Chicago Fuse Wire and Manufacturing Company, 170 South Clinton Street, Chicago, is distributing a circular describing the "Union" sectional switch box. Particular attention is called to the fact that where it is preferred to build up from the single unit, the company is furnishing, when specified, the single box with one side removable, which permits the spacers to be inserted to make any number of gangs, thereby doing away with two-gang boxes entirely. But it is found that many contractors prefer to buy the two-gang box already assembled and to build up from it, thereby avoiding the expense of making up the two-gang, the price being the same in both cases. The Chicago Fuse Wire and Manufacturing Company is the originator of this particular style of construction and has strong patents covering it.

An interesting booklet is issued by the Le Valley Vitæ Carbon Brush Company, 405 East Tremont Avenue, New York city. It bears the title "A Little Story of a Big Success," and it tells how Darius A. Le Valley started out about fifteen years ago at White Plains, N. Y., to improve the carbon brush, and how he succeeded. The writer says that Mr. Le Valley started out to make a non-sparking, permanently self-lubricating brush of 100 per cent. efficiency, and that he "made good." The brush was a remarkable success. "With no force behind it save its own inimitable quality, the Le Valley brush pushed its first little plant in White Plains into a larger one, established a factory at East Forty-second Street, New York, and grew out of this into its present and commodious plant at 405 East Tremont Avenue, where a single office room is larger than the entire original plant." The brush is spoken of as worthy of complete dependence and exclusive use under all circumstances.

An attractive new catalogue on electric heating appliances has just been published by the Simplex Electric Heating Company of Cambridge, Mass. It is catalogue No. 15 and contains 120 pages. Among the great variety of electric heating appliances described and illustrated are dining-room utensils such as chafing dishes, coffee urns, teapots, food and plate warmers; kitchen appliances from plain stoves to complete electric ranges and including all kinds of individual cooking utensils, miscellaneous household appliances, such as many types of water heaters, flatirons, curling irons, heating pads, radiators and foot warmers; factory appliances, such as glue pots, soldering irons and branding tools; and a complete line of tailors' and laundry irons. Quite a number of special applications of electric heating are also described, all of which illustrate the rapid advance being made in the art. All the heating appliances listed in this catalogue contain non-inductive resistance units, consequently they are suitable alike for direct current or alternating current.

The Maschinenfabrik Oerlikon of Oerlikon, near Zurich, Switzerland, has published recently a large number of bulletins and special pamphlets describing many of its products and noteworthy installations of its machinery. These publications are handsome examples of the art of the printer and engraver. In addition their intrinsic worth makes them especially valuable to persons interested in electrical machinery manufactured in Europe. Among the subjects treated are energy losses in generators, new armature windings for polyphase generators, automatic safety appliances for grade crossings on electric railways, induction regulators, wave forms of single and polyphase generators, single-phase railway motors, storage-battery equalizing set in the alternating-current plant of the Sandviken Iron Works, steam turbo-generator installations, electrically driven fire engines, small-motor department of the Oerlikon works, switching locomotives operated by storage batteries, electric works on the Rhine Valley Canal between Austria and Switzerland, hydro-electric plants and sub-stations of the Luzerne-Engelberg system, electric plant of the city of Chur, the single-phase railway between Locarno, Pontebrolla and Bignasco. One pamphlet describes and illustrates an extensive line of portable electric tools, such as drills, hoists, grinders, buffers, air compressors and centrifugal pumps. These publications serve to give a good idea of the wide range of the Oerlikon company's products.

MISCELLANEOUS.

At the regular weekly luncheon of the Electric Club of Chicago, held June 24th, Mr. Max W. Zabel, an electrical patent attorney, delivered a brief but interesting address on the "Commercial Aspect of Inventions."

An inspection of electric wiring by the underwriters has revealed much defective work in Pendleton, Ore. It is said that nearly all the large buildings in the city will be rewired this summer in order to comply with the National Electrical Code.

The City Council of Minot, N. D., has decided to locate the pumping station for city water supply on property of its own. The pumps will be electrically operated, the Minot Light and Telephone Company having agreed to furnish current at three cents a kilowatt.

The annual report of the commissioner of patents of the United States Patent Office for the year 1906, which was submitted to Congress on February 10, 1907, has just been published. After an eight-page summary of the business done, there follows a complete list of the patents granted during that year arranged alphabetically by names of patentees and assignees and followed by an alphabetical list of inventions. There are also similar lists of designs, trademarks, labels and prints. These lists take up 1,197 pages of the report. During the year there were issued 31,186 patents on inventions and 620 on designs.

TRADE NEWS.

During the 11 months ended on May 31, 1908, the value of electrical machinery exported by the United States to Germany was $93,288 and of electrical appliances $187,629. Corresponding figures for the year before were $89,146 and $339,368.

The committee appointed by the creditors of the International Telephone Manufacturing Company recently reported that because of the unwillingness of certain creditors to accept the proposition of further extensions to the company for payment of its indebtedness bankruptcy proceedings must ensue. It is now announced that a petition in bankruptcy was filed on June 26th.

The Simplex Electric Heating Company of Cambridge, Mass., gives this notice: "For the purpose of providing vacations and overhauling, our factory will close Thursday, July 2d, and remain closed until Monday, July 13th. The best possible attention will be given your orders during this period, but necessarily it will not be practical to supply anything that is not in finished stock. By concentrating the vacation period in this way, while delays will occur that may be an inconvenience during this period, on the whole we can give better service than by allowing the vacations to be taken throughout the season, thereby reducing the efficiency of our shop over a long period."

Randolph C. Barrett of Newark, N. J., has been appointed temporary receiver for the Consolidated Railway Lighting and Refrigerating Company, a $22,000,000 corporation with an office at 5 Nassau Street, New York. The concern was formed in 1901 by Isaac L. Rice, president of the Electric Boat Company, and he has since been president. The application for the receivership states that while the company was authorized to engage in the business of lighting railway cars and operating electric fans in cars by power derived from the operation of trains, the company has confined its activities to owning and holding stocks and securities of other companies.

The annual summer conference of the salesmen of the Fostoria Incandescent Lamp Company was held last month at Ballast Island in Lake Erie, near Put-in-Bay. It was attended by about twenty-five representatives from all parts of the United States, and an extensive programme was carried out. This meeting was pronounced to be a marked success and was an especially important one on account of the fact it was the first to be held since all of the high-economy units have been commercially perfected. The factory of the Fostoria company is now undergoing extensive alterations and enlargement. In addition, the construction is being strengthened throughout on account of the manufacture of tungsten lamps. Heavier material, including heavy maple flooring, is being installed, and when the work is finished the factory will not only be practically as good as new, but have a considerably larger production and correspondingly better equipment.

BUSINESS.

The Samson Cordage Works of 88 Broad Street, Boston, gives five reasons why Samson spot cord (waterproofed) for hanging arc lamps is the most durable, the most economical and the safest. These reasons are set forth in a neat folder, which, with sample of the cord, can no doubt be obtained on application to the company.

For the last six months the Utah Light and Railway Company has been conducting a new-business campaign in Salt Lake City based upon a wider introduction of Nernst lamps. The results up to May 30th show orders for Nernst lamps totaling 3,559 glower units from 171 customers. The majority of these customers were won over from gas.

In the oil fields gas engines are running 24 hours a day, seven days in the week, using Edison primary batteries, and the men in charge do not have to look to their ignition oftener than once or twice a year. Then a few minutes are required to renew the cells, which at once become the same as new cells. Gas-engine owners will be interested in this fact. The men in the oil fields praise the inventive genius of Thomas A. Edison whenever the ignition question is brought up. His primary batteries and spark coil are now met with on every hand.

DATES AHEAD.

National Electrical Contractors' Association (annual meeting), Chicago, July 15th, 16th and 17th.

Michigan Electric Association (annual meeting), Grand Rapids, Mich., August 18th to 21st.

International Association of Municipal Electricians (annual convention), Detroit, Mich., August 19th, 20th, 21st.

Ohio Electric Light Association (annual convention), Hotel Victory, Put-in-Bay Island, August 25th, 26th and 27th.

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

Chicago Electrical Show (fourth annual), Coliseum, January 11 to 23, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) June 23, 1908

891,232. Liquid Rheostat. Herbert W. Cheney, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed October 31, 1906.

A water rheostat contains a number of connected fixed plates forming one electrode, a number of connected pivoted plates forming the other electrode, means for rotating the latter plates to vary their depth of immersion, and means for adjusting the perpendicular distance between adjacent plates.

891,233. Sound-recording Apparatus. Charles L. Chisholm, Edmonton, Alta, Canada. Application filed July 15, 1907.

The apparatus comprises a stylus, a diaphragm for operating the same, an electromagnet for actuating the diaphragm, an adjusting screw carried by a casing and serving to move the electromagnet toward and from the diaphragm, and locking screws holding the magnet as adjusted.

891,236. Electric Motor Controller. John Dillon, Milwaukee, Wis., assignor to the Barth Elevator Company, Milwaukee, Wis. Application filed June 24, 1904.

A relay switch on each side of the motor devices controls the main circuit. A derived circuit from the main circuit includes the electromagnetic elements of the switches and a primary switch controls the derived circuit.

891,241. Method of and Means for Starting Dynamo-electric Machines. Budd Frankenfeld, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed January 31, 1907.

This method of starting a synchronous motor or converter consists in driving it above synchronism by an auxiliary motor, loading the synchronous machine to slow down the auxiliary motor, and then connecting the synchronous machine to the source of alternating-current supply when it is approximately in synchronism and phase therewith.

891,248. Smelting Furnace. Eugen A. A. Grönwall, Ludvika, Sweden. Application filed May 1, 1906.

The furnace has a closed chamber containing particles of carbon and a second chamber containing electric heating elements and capable of being heated to a temperature of 1,000° C. by an electric current.

891,251. Floor-sandpapering Machine. Frederick Harbers, Peoria, Ill. Application filed November 2, 1906.

An endless abrading belt is motor driven and arranged so that a portion of its lower fold is brought into adjustable contact with the floor.

891,254. Electrical Water Heater. Harry M. Hill, St. Louis, Mo., assignor to the Hill Electrical Manufacturing Company, St. Louis, Mo. Application filed July 29, 1907.

In combination with a shell provided with an open end is a cap piece for closing this end, a cylindrical electrode arranged in the shell and insulation posts secured to the cap piece for supporting the electrode in position.

891,263. Electrical Apparatus. Charles J. Klein, New York, N. Y., assignor to Ralph A. Schoenberg, New York, N. Y. Application filed May 7, 1907.

A plug receptacle is provided with a face plate therefor having an opening therein and a number of shutters pivoted adjacent to the opening and adapted to open outwardly upon the insertion of a plug.

891,264. Device for the Purification of Metals. Charles T. Knipp, Urbana, Ill. Application filed August 7, 1906. Renewed April 22, 1908.

The apparatus has means for generating in vacuo an electric arc and vaporizing the metal thereby; also means for condensing the vapor and for separating and discharging the metal distillate.

891,265. Process for Purification of Metals. Charles T. Knipp, Urbana, Ill. Application filed August 6, 1907.

This process consists in generating an electric arc between two portions of the metal to be purified in a partial vacuum, thereby vaporizing the metal and then condensing the vapor produced out of contact with the impure metal.

891,273. Clamping Means for Core Plates of Dynamo-electric Machines. Charles E. Lord and William H. Powell, Norwood, Ohio, assignors to the Bullock Electric Manufacturing Company. Application filed September 14, 1905. Renewed January 22, 1908.

A means for clamping core laminæ to a support comprises an abutment and a spring ring, the support having a groove in which the ring is partially seated. Means for preventing displacement of the ring comprise an overhanging portion of the support and an engaging shoulder on the ring.

891,276. Safe, Vault, etc. Alexander W. Marr, Hamilton, Ohio, assignor to the Herring-Hall-Marvin Safe Company, New York, N. Y. Application filed June 30, 1906.

Two bolt-retracting motors are provided. These are under the control of a time mechanism and arranged so that the second motor operates only if the first has not fully withdrawn the bolts.

891,282. Speed-limiting Device. Anthony L. McHugh, Cincinnati, Ohio, assignor to the Bullock Electric Manufacturing Company. Application filed August 9, 1905.

A switch is normally held in open position by a latch. A centrifugal device consists of a weighted spindle that releases the latch at a definite speed limit.

891,303. Signaling System for Railways. Louis H. Thullen, Edgewood Park, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Application filed June 9, 1906.

This system is adapted for single-phase railways and has a direct-current source and a relay with a fixed polarity field in each block.

891,306. Rotary Oil Switch. Hermon L. Van Valkenburg, Norwood, Ohio, assignor to the Bullock Electric Manufacturing Company. Application filed August 21, 1905.

In an oil tank are mounted a number of vertical contact rods whose contact members lie in different planes. A rotary contact drum is arranged to engage the contact members.

891,316. Dynamo-electric Machine. Robert B. Williamson, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed July 30, 1906.

A commutator construction comprises a hub or spider, segments mounted thereon and having undercut slots intermediate their ends, a clamping ring surrounding the hub and adapted to fit into the slots, and radial means engaging the ring for forcing the latter axially into the slots.

891,320. Induction Coil. Donald H. Yost, York, Pa., assignor of one-half to Frederick R. Yost, York, Pa. Application filed October 23, 1907.

A special construction for an induction coil is described.

891,323. Fuse. Bert A. Brown, Churchville, N. Y. Application filed June 13, 1907.

In a circuit are included an alarm, a switch and contacts. A second set of contacts is connected with the contacts of the former circuit. A pivoted arm is adapted under abnormal conditions to bring the second set of contacts in electrical connection to close the former circuit. A visible signal is actuated by the arm so as to be displayed when the arm is thrown outward, and a fuse wire normally holds the arm in restraint.

891,339. Railway Signal. Franz Hirt, Berlin, Germany, assignor to the General Electric Company. Application filed December 11, 1907.

This system provides a double-refracting body, a pair of selenium cells exposed, respectively, to the two sets of rays refracted therefrom, opposing magnet windings in circuit with the cells, signal-operating means controlled by the differential action of the windings, and means carried by a vehicle for throwing polarized light on the body.

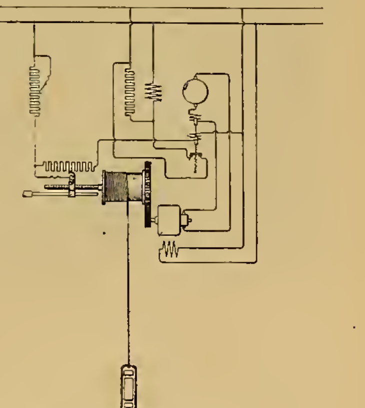
891,343. Flexible Electrical Connection Device and the Like. Charles A. Keller, Paris, France. Application filed December 7, 1907.

The connection comprises a conductor composed of a number of strips of flexible material and separable parts electrically secured to the conductor and movable apart from each other a distance less than the length of the strips whereby these are maintained slack.

891,350. Generation and Transmission of Motive Power. George W. Mascord, London, England. Application filed February 17, 1908.

A main motor and a supplemental motor are provided with electrical means for automatically clutching the latter motor to the main motor when the load increases beyond a predetermined amount.

891,352. Towing System. Wilbur L. Merrill, Schenectady, N. Y., assignor to the General Electric Company. Application filed February 9, 1907.



No. 891,352.—TOWING SYSTEM.

The system provides a rotatable drum for paying out a hawser, an electric motor for producing a torque on the drum, a screw and nut operated by the drum, and means controlled by the screw and nut for controlling the torque of the motor. (See cut.)

891,361. Means for Electroplating Rods, Pipes, etc. Daniel H. Murphy, New Castle, Pa. Application filed October 30, 1907.

A tank with an electrolyte therein has an anode adapted to be contained within the pipe and means for preventing contact between this anode and the pipe and for rotating the pipe relatively to the anode.

891,400. Electric Heater and Means for Controlling the Same. Peabody A. Brown, Denver, Colo. Application filed August 20, 1906.

An electromagnet whose coils are in the same circuit with the coils of the heater has its armature provided with a beveled contact located in the circuit. A thermostat for automatically making and breaking the circuit has a movable bar also provided with a beveled contact adapted to engage that of the armature when the circuit is closed.

891,410. Trolley for Electric Cars and the Like. Edward J. Dacey, Prescottville, Pa. Application filed October 11, 1907.

A cylinder is swiveled into the upper end of the trolley pole. The cylinder contains a plunger that has the trolley wheel journaled in its upper end.

891,414. Thermal Cut-out. Charles A. Ernst, Schenectady, N. Y., assignor to the General Electric Company. Application filed April 6, 1904.

A casing contains a main fuse and an auxiliary or indicating fuse in parallel therewith that has a portion of its length exposed to view on the outside of the casing.

891,425. Limit-switch Device. Sam H. Kanmacher, Schenectady, N. Y., assignor to the General Electric Company. Application filed December 18, 1905.

In combination with a motor and a reversing controller is a relay for controlling the motor circuit, connections between the controller and the relay coils arranged to change the relative polarities of the coils in the forward and reverse positions of the controller, a switch in the circuit containing one of the coils, and means controlled by the motor for operating the switch.

891,455. Hot-water Heater. George L. Bennett, Trenton, N. J. Application filed April 4, 1907.

In connection with a water faucet and valve is an elongated electrical resistance device, a jacket therefor, a casing surrounding the jacket and forming a channel within the casing and communicating with the valve. A house or service pipe discharges into the casing.

891,463. Electrothermal Protector. Frank B. Cook, Chicago, Ill. Application filed May 23, 1907.

The protector consists of a lightning arrester and a thermally operable device near one edge of a ground plate. One of the electrodes of the lightning arrester engages the ground plate and a contact member extends from the thermal device through the lightning arrester to contact the ground plate upon abnormal current conditions so as to ground a circuit.

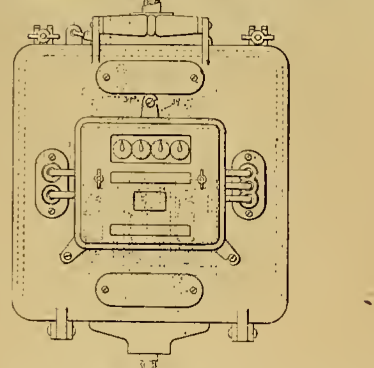
891,496. Electrical Transformer. August R. Luschka, River Forest, Ill., assignor to the Western Electric Company, Chicago, Ill. Application filed December 11, 1905.

An induction coil has a secondary winding about the primary winding and consisting of two hollow truncated conical sections with their small ends meeting at substantially the longitudinal center of the core, and truncated conical end heads for the coil adapted to nest with the sections.

891,556. Automatic Train Stop. Joseph H. Lynch, Red Bank, N. J. Application filed May 1, 1907.

In combination with a vehicle motive power controller is an actuating piston therefor, a magnetically controlled valve, circuit-controlling devices for governing its action, resetting mechanism for restoring the circuit-controlling devices to position for causing the valve to shut, and means governed by the piston for operating the resetting mechanism.

891,561. Combined Electric Service Cut-out and Meter Board. Henry E. McGowan and Edwin R. Ellsworth, New York, N. Y. Application filed October 21, 1907.



No. 891,561.—COMBINED SERVICE CUT-OUT AND METER BOARD.

A casing encloses the cut-out board and has the meter mounted on the outside of its cover. Connections pass through the cover from the meter to the terminals in the casing. (See cut.)

891,568. Valve-operating Mechanism. Wilson B. Runnion and Edward Runnion, Spencer, W. Va., assignors of one-half to Lewis S. Goff, Spencer, W. Va. Application filed June 22, 1907.

A conduit with a controlling valve therein has an electromagnet for holding the valve in a predetermined position, a circuit closer located in the circuit and including a stem, and a diaphragm located in the conduit and operating against the stem.

891,589. Automatic Electric Regulator. William L. Bliss, New York, N. Y. Application filed August 24, 1904.

A differentially compound motor operates the contact arm of a shunt-field rheostat for the main generator. One field of the motor is in series with the main line, the other is in series with the motor armature, and these are connected across the line between the generator and an automatic switch.

891,617. Electric Switch-operating Machine. Leslie A. Hedger, Mill Valley, Cal. Application filed January 7, 1907.

A remote-control device comprises mechanism for slowly and positively closing electric switches and for rapidly opening the same, a solenoid and plunger for operating the mechanism, means for locking the switch in the open position, and a gravity catch for locking the switch in the closed position.

891,619. System of Electric Traction. Samuel H. Hoopes, Jr., West Chester, Pa. Application filed August 10, 1907.

A collecting member adapted to engage electrical contacts is resiliently supported upon a car, this member being resiliently held against movement longitudinally of the car.

891,627. Alarm Device. George W. MacKenzie, Ben Avon, Pa., assignor to the Butler Manufacturing Company, Butler, Pa. Application filed November 30, 1907.

An alarm for fluid pressures consists of an enclosing case provided with a fluid connection and a movable dam having a stem provided with spaced terminal contacts, a relatively movable contact element adapted to be engaged by either of the stem contacts and an alarm.

891,632. Electric Brake Mechanism for Cars, Elevators, Cranes and Other Purposes. Michael E. Neenan, New York, N. Y., assignor to the Otis Elevator Company, Jersey City, N. J. Application filed March 22, 1905.

In combination with a brake-wheel, a brake-shoe, a spring and suitable connections applying brake pressure to shoe is a magnet retracting the shoe in opposition to this pressure, and a supplemental magnet applying additional pressure to the brake-shoe when seated on the wheel, and a separate source of electricity for brake-applying magnet.

891,647. Igniter. William L. Wayrynen, Dolph, S. D. Application filed June 15, 1907.

The movable electrode is controlled by a device dependent on the variations of pressure in the cylinder and on the position of the piston.

891,657. Apparatus for the Electrical Production of Heat for Cooking and Other Purposes. Arthur F. Berry, Ealing, England. Application filed August 9, 1906.

In this electrical heating apparatus there is a secondary conductor comprising a portion in which current is directly induced, and a current-carrying portion extending alternately in opposite directions so as to form two connected parts arranged in inductive relation to each other.

891,712. Trolley. Abel Molnar, Pittsburg, Pa. Application filed March 14, 1908.

Two arms are mounted on the outer ends of the trolley-wheel axle and extend on their upper ends over the wheel.

891,720. Motor-controlling Device. William C. O'Brien, Baltimore, Md., assignor to the Monitor Manufacturing Company of Baltimore City. Application filed January 19, 1907. Renewed January 28, 1908.

An automatic controller has windings in the armature circuit and is adapted to cut resistance out of this circuit when the starting current is below a certain value and to prevent cutting out resistance when the armature current is too high.

891,721. Starter for Electric Motors. William C. O'Brien, Baltimore, Md., assignor to the Monitor Manufacturing Company of Baltimore City. Application filed April 9, 1907. Renewed November 22, 1907.

Details of the solenoid controller of the preceding patent are described.

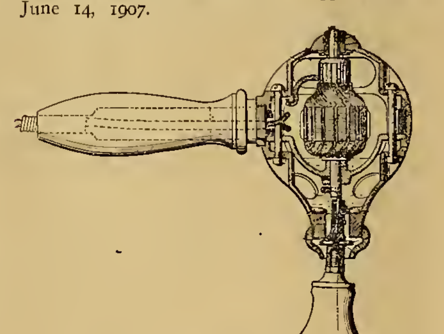
891,722. Starter for Electric Motors. William C. O'Brien, Baltimore, Md., assignor to the Monitor Manufacturing Company of Baltimore City. Application filed June 24, 1907. Renewed February 14, 1908.

This is a modification of the one above.

891,743. Fire and Temperature Alarm or Indicator. George L. Smith, Aberdeen, Scotland. Application filed March 19, 1908.

This device has two alarms, one operated by a sudden rise of temperature, and the other by a more gradual but steady heat.

891,776. Vibrator for Movement-cure Purposes. James B. Kirby, Cleveland, Ohio, assignor to Lewis Sands, Cleveland, Ohio. Application filed June 14, 1907.



No. 891,776.—VIBRATOR.

The vibrator has a motor-driven shaft with a crank stem, an applicator support engaged with the crank stem, and a pair of spring fulcrum members for the support. (See cut.)

891,779. Electrically Governed, Automatically Operable, Train-controlling System. Harvey B. Miller, Staunton, Va., assignor of one-half to James A. Bell, Staunton, Va. Application filed October 10, 1907.

The system comprises several pairs of contacts, a switch co-operative with each two pairs and adapted to simultaneously bridge the contacts of each pair, conductor rails connected with certain of the contacts, magnets electrically connected with the remainder of the contacts, and switch-locking means controlled by the magnets.

891,780. Air-brake Apparatus. Harvey B. Miller, Staunton, Va., assignor of one-half to James A. Bell, Staunton, Va. Original application filed October 10, 1907. Divided and this application filed December 16, 1907.

A valve for controlling the discharge of air from a train pipe has a weighted arm, a magnet having an armature constituting a detent for engaging and normally holding the arm against movement when the magnet is de-energized, and a swinging lever to which the armature or detent is connected for movement therewith.

891,784. Single-phase Commutator Motor. Stanley S. Seyfert, South Bethlehem, Pa., assignor of one-half to William S. Franklin, South Bethlehem, Pa. Application filed January 31, 1905.

This motor has the commutator stationary and connected with the stator. The rotor is not commutated.

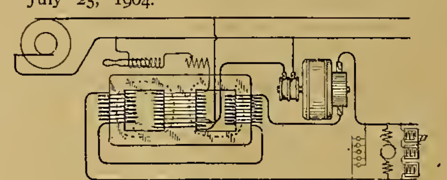
891,786. Telephone System. Nathan H. Suren, Highlandville, Mass., assignor to the Gamewell Fire Alarm Telegraph Company, New York, N. Y. Application filed March 16, 1906.

In a signal system there is a lighting circuit and a telephone circuit, the telephone being inside of a signal box. The telephone circuit includes a magnet for closing the switch of a lamp within the box, which also contains a drying device in the form of a resistance in multiple with the lamp and continually receiving current from the lighting circuit.

891,792. Car Stop and Speed Signal. Joseph F. Bush, Schenectady, N. Y., assignor of 35 one-hundredths to George Lewes Cooper, Troy, N. Y. Application filed November 20, 1907.

In combination with the controller for varying the power applied to a car are a number of visual signals for indicating such power variation carried on the car and automatically controlled by the controller. The signals are so located on the car as to be visible at a distance therefrom.

891,797. Method of Automatic Regulation of Rectifiers and Rotary Converters. Francis B. Crocker, New York, N. Y. Application filed July 25, 1904.



No. 891,797.—REGULATION OF ROTARY CONVERTERS.

This method of regulating electric circuits consists in introducing in the main circuit inductance set up by the combined effects of alternating and direct currents, which latter constitutes the load circuit. (See cut.)

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired June 30, 1908:

454,867. Electrical Transmission of Telegraphic and Time Indications. H. J. Haight, New York, N. Y.
454,873. Carbon for Electric Arc Lamps. W. H. Lawrence, Cleveland, Ohio.
454,881. Overhead Electric Conductor System. G. J. Scott, Minneapolis, Minn.
454,883. Motor Generator or Transformer. G. J. Scott, Minneapolis, Minn.
454,884. Printing-telegraph Instrument. F. Sedgwick, Chicago, Ill.
454,890. Apparatus for Removing Inductive Effects from Electric Lines. E. Thomson, Lynn, Mass.
454,903. Means for Connecting Trolley and Feed Wires. J. R. Fletcher, Chicago, Ill.
454,904. Aerial Cut-out. J. R. Fletcher, Dayton, Ohio.
454,924. Hotel Indicator. F. B. Wood, New York, N. Y.
454,926. Protector for Use in Electric Circuits. W. H. Clausen, Melrose, Mass.
454,938. Method of Laying Electric Conduits. A. C. Chenoweth, New York, N. Y.
454,939. Means for Constructing Electric Conduits. A. C. Chenoweth, New York, N. Y.
454,949. Electric Meter. H. M. Pilkington and R. S. White, Brooklyn, N. Y.
454,969. Electric-current Regulator or Rheostat. C. D. Sigsbee, U. S. Navy, and T. S. Haywood and F. S. Anderson, Easton, Md.
454,973. Electric-signaling Apparatus. M. Martin, Malden, Mass.
454,974. Circuit for Electric Signaling. M. Martin, Malden, Mass.
454,979. Electric Heater. C. W. Drew and E. R. Francis, Minneapolis, Minn.
454,985. Electric Temperature Controller. E. H. Parker, Evanston, Ill.
454,995. Electric Switch. J. Des Brisay, New York, N. Y.
455,005. Circuit Closer for Burglar Alarms. D. A. Palmer, Chicago, Ill.
455,016. Electrical Annunciator. W. F. Harte and C. A. Gerold, Omaha, Neb.
455,019. Circuit Connection for Electric-car Motors. A. A. Ingraham, New York, N. Y.
455,038. Pneumatic Fire-alarm Telegraph Apparatus. A. Goldstein, Baltimore, Md.
455,041. Electric Clock for Use in Electric-lighting and Other Systems. F. von Hefner-Alteneck, Berlin, Germany.
455,055. Electric Time-denoting Device. William Ramsay, Washington, D. C.
455,067. Electromagnetic Motor. N. Tesla, New York, N. Y.
455,068. Electrical Meter. N. Tesla, New York, N. Y.
455,075. Printing Telegraph. H. van Hoevenbergh, New York, N. Y.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, JULY 11, 1908. No. 2

SINGLE-PHASE TRACTION IN GREAT BRITAIN.

[From the London correspondent of the Western Electrician.]

The first single-phase railway in Great Britain has just been put into operation by the Midland Railway upon its branch line connecting Heysham, Morecambe and Lancaster on the northwest coast of England. The line is somewhat in the nature of an inverted Y, with Morecambe at the apex and Heysham and Lancaster at the extremities of the left and right arms, respectively. The distance from Heysham to Morecambe is five miles, and from Morecambe to Lancaster four miles.

WIDE-SPAN SUPPORTING BRIDGE FOR OVERHEAD CONSTRUCTION FOR FIRST SINGLE-PHASE RAILWAY IN ENGLAND.

It may be pointed out that the company has selected this line for carrying out the experiment of testing the suitability of single-phase traction for heavy railway working in preference to a busier section, for the reason, among others, that the section in question is subject to very severe weather conditions, so that a conclusive test should be obtained. Taken in conjunction with the experiment by the London, Brighton and South Coast Company near London, the results should be of some practical value to railway managers who are now wavering as to the system which should be adopted.

Overhead Construction.

Dealing first with the overhead construction, it will be noted that the type of suspension is similar to that adopted upon the Hamburg-Altona Railway in Germany, the patents for which are held in England by Siemens Bros., who are carrying out the work in this instance. The system has been modified, however, by a new type of catenary wire suspension designed by one of the railway company's engineers. The line passes under several bridges, mostly of the arched shape, and the clearance of these has been given considerable attention. The use of a single bow trolley for traveling in both directions necessitates the bow being symmetrical about the center of the car, necessarily bringing it close to the structure of the bridge. In order to get through at all, it has been necessary to take the contact wire well out toward the center of the arch, so that it may come down low and yet be clear of the loading gauge and so that the other side of the bow may clear the structure properly.

The contact wire is of figure 8 section, and the height from rail level varies from 18 feet 3 inches in the open to 13 feet 3 inches under bridges. It is suspended from short loops about four inches long from a steel cable or auxiliary wire, upon which these loops are movable. In turn, the auxiliary wire is held by the main catenary cables, of which there are two, clipped together throughout their length, except for about three feet on either side of the insulator, where they divide to pass through the grooves of a ring, the grooves being on opposite sides of the insulators. The catenary is thus free to move for this distance, and this equalizes the strain due to unequal loading, and experience has proved that it is at the same time secure in the case of the breaking of the wire.

The section switches which are provided to isolate the up and down lines or the different sections are of the double-break air pattern, and are fixed on top of the poles supporting the cross suspension for the overhead construction. Each section switch is, in addition, duplicated, and the connection from one contact wire to the section ahead is accomplished by means of a short section of switch wire which requires to be connected to the two contact wires before the line is switched through at this point. In this way a duplicate break is obtained, and, more important still, there is a short length of line into which a car can run without bridging by means of its bow two sections which it was supposed might require to be isolated.

A separate steel cable connects the wire-supporting bridges together, and this is grounded every half mile, the same earth plates being used for horn lightning arresters, thus diminishing the number of earth plates requiring attention and at the same time giving better security from danger from leaky insulators, so far as the poles are concerned. It is interesting to note that this grounded steel cable has been erected between the contact wires and the telegraph wires, which are open on one side of the line, and it is believed that this has had a great deal to do with the reduction of electrostatic induction from the contact wire. The object aimed at has been to avoid putting underground all the overhead telegraph and telephone wires.

Although at one or two places it has been necessary to erect steel lattice poles and lattice-girder supporting bridges, owing to the big spans, such as that shown in an accompanying illustration, for the most part creosoted wooden poles have been used. Where wooden poles are used the cross-suspension pieces are made of two angle-irons brought together at the ends, but so fitted that there is a great range of adjustment of the insulator position without any necessity for drilling.

The type of insulator was decided upon after ascertaining from experiments made by Siemens

Bros.' staff the minimum distance at which a 6,600-volt, 25-cycle circuit would maintain an arc in the heaviest weather. In order to get what amounts to double insulation with one insulator, the steel bolts supporting the insulators are encased with ebonite, in addition to which, in order to get extra strength, the company preferred to make the insulators in two pieces.

An interesting point arose in connection with the bonding of the track. Only the outer rail on each line is bonded throughout, the bonds being of the Forest City type, and although very great care was taken to prevent moisture getting into the holes while they were being drilled, and although after completion all the bonds were found to be first-class, yet the tests carried out afterward showed a distinct difference in resistance between those bonds made during dry weather and those made during damp weather.

The rails are grounded in the sea at Heysham Harbor by duplicate copper earth plates, while at Morecambe they are grounded at the pier by plates which have been dropped in a large cast-iron caisson. At Lancaster they are grounded to the cast-iron columns of the bridge which rest in the bed of the river. As already indicated, the potential of the overhead wire is 6,600 volts, 25 cycles, single-phase alternating current.

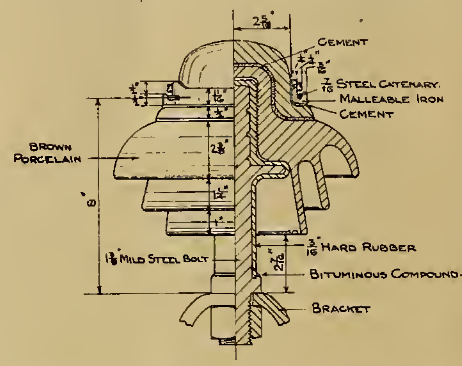
Car Equipments.

At present the rolling stock, which has been built by the railway company, consists of three trains, there being three motor cars, two having Siemens equipments and one a Westinghouse equipment. There are also four trailer cars, while in addition a number of cars will be used for workmen's and freight traffic. Driving equipments have been fitted at both ends of the motor cars. As will be seen from the illustrations, the motor cars are of the corridor type, the extreme lengths and widths being 60 feet and nine feet. Each has a seating capacity of 72 passengers, the middle seats being arranged transversely and the seats at either end longitudinally. The lighting is from the line current, as is also the heating of the motor cars; the trailer cars have not been fitted in this way yet, however, as their extended use during the winter months is not contemplated. On the trailer cars, which have a length of 43 feet and a width of nine feet, the seats are placed transversely throughout, the accommodation being for 56 passengers.

The specification of the electrical equipment of the cars called for two 340-volt motors per car, both to be carried on one truck. The normal train was specified to consist of a motor car and two trailers. The specification further made it a condition that the different equipments of the two contractors should be capable of being worked from the same master controllers. Two 180-horsepower motors are used on each Siemens car and two 150-horsepower motors on the Westinghouse car. The Westinghouse car is fitted with standard electro-pneumatic control, modified, in order to enable it to work with the all-electric control of the Siemens car.

As will be seen from the illustration, the Siemens cars are provided with two collector bows, for the reason that it was found impossible to get the firm's standard inverted pantagraph type of bow into the space available under the bridges; there is a small auxiliary bow controlled by parallel motion. The disadvantage of this type is that it requires balancing by a wind screen, as will be noticed. On the other hand, the Westinghouse company has adopted its standard type of pantagraph bow collector, and only one is used.

The roofs of all the cars are covered with a grounded wire netting whose function it is to throw out the station circuit-breakers in the event of the overhead wire coming down on the roof. On the Siemens cars the high-tension wire proceeds into the high-tension chamber, the door of which is mechanically interlocked with the bows, so that it cannot be opened unless the bows are down. The low-tension wiring is not carried in metal tubing, for fear of eddy currents, but is substantially surrounded with metal.



HIGH-TENSION INSULATOR FOR FIRST SINGLE-PHASE RAILWAY IN ENGLAND.

The equipment of the Siemens cars consists of the two motors, the main transformer, the auxiliary transformer, preventive coil, the commutating transformer, high-tension circuit-breaker and fuse in the main transformer circuit, high-tension fuse in the auxiliary transformer circuit, contactor, motor fuses (which also act as motor cut-outs) and low-tension fuses in the circuit feeding the control, and also a low-tension fuse in the circuit feeding the fan. No fuse has been placed in the brake-pump main circuits, so that if anything goes wrong with the pumps, the main fuse will be blown and the car cannot be worked.

The Westinghouse equipment consists of motors, transformers and auxiliary transformers, preventive coil, high-tension circuit-breaker in main circuit, fuse in auxiliary high-tension and low-tension circuits, contactors and control gear. The motors are ordinary series compensated, without any special commutating device other than the commutator resistance leads. It is said that the commutating performance of these motors on the line is as good as, if not better than, most heavy direct-current traction motors, while the commutator remains in quite as good running order as that of any such motor. The same good qualities are claimed for the Siemens motors as the result of trials.

Train Performance.

With regard to the performance of the trains on the road, in a test with a two-car train weighing approximately 58 tons, made incidentally in the course of ordinary running, one of the Siemens cars attained speeds of 30 miles an hour in 41 seconds and 48 miles an hour in 80 seconds, and a free running speed of 60 miles an hour in 160 seconds, starting and running for 440 yards, on an up grade of 1 in 200, there being, however, thereafter about 100 yards of level and then a down grade of 1 in 500 for 1½ miles; this portion of the line is also very considerably curved.

Power-station Apparatus.

The power supply for the line is furnished from an existing gas-driven generating station at Heysham, used in connection with the lighting and power requirements of the railway company. Mond gas producers are used, and the equipment of the station hitherto has been three 250-horsepower three-cylinder Westinghouse gas engines, driving 150-kilowatt, direct-current, 460-volt generators. In connection with the traction scheme, however, an additional 350-horsepower Westinghouse gas engine driving a 235-kilowatt generator of the same make has been installed, in conjunction with two motor-generators.

From the nature of the traffic the demand on the station will be of a very "peaky" character. During these "peaks" the whole possible output of the machinery at work in the station must be utilized, and the intention is for the engines, whatever the actual load they may be working on previous to heavy loads coming on, to work up to their full overload capacity, which is about 20 to 25 per cent. in the case of the old, and 10 to 15 per cent. in the case of the new sets, before the storage battery, which is a part of the station equipment, is called upon to discharge heavily. The latter will, however, be called on to work up to its full one-hour rate of 750 to 1,000 amperes.

The old battery booster not being large enough for these discharges, a new one has been installed. A difficulty was, however, found in that the pressure dropped badly as the loads increased. This had been compensated for by hand regulation of the excitation, or else, during "peaks," the generators continued to work at their previous loads, and the battery supplied the excess, both courses being inadmissible under the new conditions. Compound winding in the usual way was an extremely expensive remedy, since, as the copper necessary for full excitation was already on the fields, new series coils would be excessively large and heavy, added to which was the trouble of entirely dismantling the machines.

A very simple solution was found in fitting exciters, each mounted on the engine bedplate, and compound windings being fitted on these exciters and varying their voltage, and consequently that on the main generator fields, so that the existing copper on the latter was fully utilized. This not only proved a much cheaper arrangement, the exciters being only of three kilowatts capacity and of fairly high speeds, but enabled the whole change to be made in the course of a week, obviating any dis-


Siemens Car, Showing Bow Contacts.


Westinghouse Car, Showing Pantagraph Bow.

MOTOR CARS IN USE ON FIRST SINGLE-PHASE RAILWAY IN ENGLAND.

mantling or any serious stoppage of the generating sets.

The new booster, with a comparatively low continuous rating, satisfactorily commutates the "peak" discharges up to 750 to 2,000 amperes; and it can be set to make the engines work up to their overloads as above, or to work under practically any other conditions, without any serious drop on the bus-bar voltage.

The new generating set is of the Westinghouse latest type of gas engine, having three cranks with three sets of cylinders, two in tandem in each case. Its speed is 300 revolutions per minute and its lubrication forced.

High-tension and Contactor Chambers are Shown Open.
UNDERFRAME OF SIEMENS CAR USED ON FIRST SINGLE-PHASE RAILWAY IN ENGLAND.

The specification for the motor-generators called for the machines to be each capable of a continuous output of 150 to 200 kilowatts, with a temperature rise of 80° F., but they were also called upon to be capable of safely carrying output overloads of 900 kilowatts instantaneous, 600 kilowatts for half a minute, 500 kilowatts for three-quarters minute and 300 kilowatts for 2½ minutes, and were required to be also tested under a regular cycle of these overloads, with underloads in between, for eight hours. Further, they were required, with the assistance of external means, if necessary, to restore the pressure to normal within seven seconds of the coming on or throwing off of loads up to 600 kilowatts at 0.8 power factor or 300 kilowatts at power factors down to 0.3. The machines of the Electric Construction Company were finally selected.

The switchboard has been designed and constructed by the railway company, the instruments being of the Westinghouse company's make. Each of the motor-generators is supplied from the low-tension bus-bars through a no-voltage and overload circuit-breaker. The shunt circuit is excited through a separate double-pole knife switch with kicking contacts and resistances. Starting resistance is cut out by means of a set of knife switches. By means of a throw-over switch these can be used to start either set of the machines, a heavy triple-bladed knife switch being thrown in finally when the machines are fully started up, connecting them direct to the bus-bars. On the alternating-current side each alternator is connected up to the bus-bars by a hand-operated oil switch, and the current passes from the bus-bar through duplicate automatic circuit-breakers to duplicate feeders passing out through overhead lines. All the circuit-breakers, both high and low-tension, have time-limit devices. The exciter shunt fields of the alternators are also connected through double-pole switches with non-inductive contacts and resistances. The high-tension apparatus is contained in a lockfast expanded metal chamber placed over and at the back of the actual switchboard, the switches being operated from the handles of the latter through rodding. The door of the high-tension chamber is interlocked with the holding up coil of the motor circuit-breaker, so that unless the door is closed neither motor-generator set can be started, while if it is open during running everything stops.

I have to thank the officials of the Midland Railway Company for the illustrations and material contained in this article.

On July 2d the city of Berlin, Germany, opened the first street railway owned by that municipality. The fare is about 2½ cents for single rides and slightly less for monthly tickets.

THE NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION.

By W. H. Morton.

The first steps toward the organization of the National Electrical Contractors' Association were taken in New York state about ten years ago. The New York state contractors organized an association in 1896, which gradually grew until it covered most of the contractors in the state. This organization proved a benefit to all of its members, and in 1901 the state association appropriated the necessary money for calling a convention in Buffalo to discuss the question of forming a national association. Notices were sent to practically all the contractors in the country asking them to attend this meeting, and when the meeting was called to order 200 concerns were represented.

Many of the delegates were representing a number of companies, and were unable to act until they had reported to their principals, but all were in favor of forming an association, and when the meeting adjourned the plans were perfected and the organization had 31 members. From then until the present time there has been a steady growth, and now the association has a membership covering practically the entire country and including a large proportion of the electrical contracting trade.

The object of the organization, broadly stated, is to improve the conditions of the contracting trade throughout the country. Undoubtedly this is a day of organization; it is almost impossible for any business to improve except by concerted action of all the parties interested.

The business of the electrical contractor at the time the association was formed had hardly risen to the dignity of a recognized trade, and anyone with a screw-driver and a pair of plyers advertised himself as an electrical engineer and contractor.

The association, working with other national organizations in the electrical field, has forced the recognition of the contractor, and he is now considered a factor in the electrical business and in the building industry of the country.

One of the first matters that the association took up was the question of wiring rules and the inspection of work. A committee was appointed in July, 1902, to take up this question, and in December of that year this committee was allowed the privilege of the floor at the underwriters' meeting, where the changes in the rules are discussed.

In January, 1903, the association, through its committee, obtained membership in the National Conference on Standard Wiring Rules. Our committee has always taken a conservative position in connection with any changes in the rules, and by this course has placed itself in a position where its opinions carry weight. The members of the committee have urged changes in the rules, as far as practical, to make them more strict, so as to raise the standard of electrical construction.

One particular point that the committee has steadily worked for is a uniform interpretation and enforcement of the rules in the National Electrical Code. We feel that these rules are the result of careful study and thought, and that in the main they are satisfactory. The dissatisfaction with them comes from the fact that they are not uniformly enforced by the inspectors, and this can only be corrected by a campaign of education.

Another important subject that the association had to consider was the labor question. In July, 1904, a committee was appointed to take up this matter, and the committee investigated the subject carefully. It was found that conditions among the members were radically different in different sections; some members wanted open shop, some union shop, and some were using both union and non-union labor. On account of these conditions it seemed impossible to take any action as a national body. The committee recommended the formation of labor information bureaus in different sections of the country, and the exchange of information between such bureaus. The idea of these bureaus is to obtain complete records of all of the workmen, and eventually to have all of this data collected at a central point, where it is readily accessible.

The matter of legislation for licensing contractors is a good deal like the labor question, from the fact that the conditions vary so greatly in the different states that the national association can only act in an advisory capacity. The committee on

HEYSHAM GAS-ENGINE POWER STATION SUPPLYING CURRENT FOR FIRST SINGLE-PHASE RAILWAY IN ENGLAND.

legislation has collected and is collecting data on this subject, and will furnish this to any of the members interested on the question. The committee urges the advisability of endeavoring to secure a license law in each state. Such a law will do more to elevate the contracting trade than any other action that can be taken, and such a law is a protection to life and property through its preventing poor work, and one can readily appreciate its benefits to the licensed contractor.

Another question which naturally comes before any business organization is the question of buying and selling conditions. This was probably the most important matter that the national association had to deal with at the time of its organization. From the start the association has felt that the proper regulation of conditions in any trade should be accomplished through the concerted action of the manufacturer, the jobber and the retailer, or in our business the contractor. The association is working along these lines to secure a proper division of the business, so that the contractors can do the retail business which properly belongs to them.

The organization has adopted a standard set of symbols for marking electrical work on plans. These cover the subject thoroughly and have been adopted by the American Institute of Architects and several departments of the United States government. The use of these uniform symbols saves the contractor much annoyance and loss of time in making estimates and prevents many misunderstandings.

A committee was also appointed at the sixth annual meeting to investigate and report on the feasibility of the adoption of a standard form of specifications and contract, and will report at the next meeting.

The association, through a special committee, is a part of the Co-operative Electrical Development Association. This organization was formed for the purpose of extending the use of all kinds of current-consuming devices, and has the support of all branches of the electrical industry. Its work will extend over the entire country, and naturally any increase in the use of electrical devices must result in increased construction work and consequently benefit the contractor.

In connection with the work of the national association, a publication, called the National Electrical Contractor, was started in November, 1901. The paper is not in any sense a technical one, but publishes practical articles of interest to the contracting trade. Its columns are open for the discussion of any question that is of interest to the contractor, and much useful information can be obtained from each issue.

The association is prepared to take up, through committees, any subject that affects the conditions of the trade, and to do anything possible to improve the general conditions.

NATIONAL ELECTRICAL CONTRACTORS' CONVENTION.

The eighth annual convention of the National Electrical Contractors' Association of the United States will be held at the Auditorium Hotel, Chicago, on July 15th, 16th and 17th. It is expected that the attendance will be large, including contractors from all parts of the country and the usual complement of guests, consisting of contractors' wives and persons interested in supplying materials to the trade. The morning sessions on the 15th and 16th will be open for general discussion, and talks on matters of interest will be given by prominent electrical men. The afternoon sessions will be for members only. Entertainment features will not be lost sight of as will be seen by the following programme:

WEDNESDAY, JULY 15TH.

Open Session, Beginning at 10 a. m.

Address of Welcome—President of the Electrical Contractors' Association of Illinois.

Opening Address—James R. Strong, president National Electrical Contractors' Association.

"The Electrical Contractor's Opportunities in the Illuminating Field"—George Loring.

"The Relations Between the Underwriters and the Contractor"—W. H. Merrill, Jr.

Afternoon Session.

Business session, beginning at 2 p. m.

Evening Features.

Men's banquet, 7 p. m., Gold banquet hall, Auditorium Annex.

Ladies' banquet, 7 p. m., Small banquet hall, Auditorium Annex.

Banquets will be followed by a vaudeville show for ladies and gentlemen.

THURSDAY, JULY 16TH.

Open Session (Morning).

"Illuminating Engineering"—J. R. Cravath.

"The Relations Between the Lighting Company and the Contractor"—Alex Dow.

"The National Electrical Contractors' Association"—Seth B. Witherbee.

Afternoon Session.

Business session, beginning at 2 p. m.

Evening Features.

Business session, 7 p. m.

Rejuvenation of the Sons of Jove.

Ladies' theater party.

FRIDAY, JULY 17TH.

All-day outing for members and guests on steamship Theodore Roosevelt to Michigan City. Sports games and baseball between the eastern and western teams of the Contractors' Association.

The principal officers of the National Electrical Contractors' Association are:

President—James R. Strong, New York.

Vice-presidents—G. M. Sanborn, Indianapolis; C. R. Kreider, Chicago; F. C. Werk, Cleveland.

Secretary—W. H. Morton, Utica, N. Y.

Treasurer—John R. Galloway, Washington, D. C.

The Chicago committee having in charge the arrangements for the convention consists of C. R. Kreider, Arthur Frantzen, Ernest Freeman, Henry Newgard and Warren Orne.

G. M. Sanborn, Indianapolis, First Vice-president.

James R. Strong, New York, President.

C. R. Kreider, Chicago, Second Vice-president.

F. C. Werk, Cleveland, Third Vice-president.

W. H. Morton, Utica, N. Y., Secretary.

John R. Galloway, Washington, D. C., Treasurer.

OFFICERS OF THE NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION.

DRAINAGE CANAL POWER AND THE CITY OF CHICAGO.

The Sanitary District, which is in control of the Chicago Drainage Canal, complains that it is prevented, by apparent lack of co-operation on the part of the city authorities of Chicago, from selling its surplus electric power, generated at the Lockport plant. It is charged that the District is prevented from building pole lines and conduits within the city limits. The subject has been investigated by a committee of the Citizens' Association of Chicago, composed of George E. Cole, Wilford C. Shurtleff and Shelby M. Singleton, which, under date of June 27th, has made a report favorable to the attitude of the Sanitary District. The principal question seems to be whether the District should not be required to secure frontage consents for the construction of its lines. The law would seem to make this a necessary requirement (although this is disputed), but, according to the Citizens' Association committee, the District is unable to comply with this provision. Therefore, the District wants permission to use the city's pole lines and conduits jointly for a suitable compensation, but although permission has been granted, it is burdened, according to the District, with many restrictions.

One point of view taken by city authorities is this: "It has been suggested that the amount of horsepower developed by the Sanitary District does not justify the stringing of high-potential wires all over the city of Chicago, and that it might be a better policy to sell the power thus developed within a limited area, as near the point of initial distribution as possible."

What follows is taken from the report of the investigating committee of the Citizens' Association:

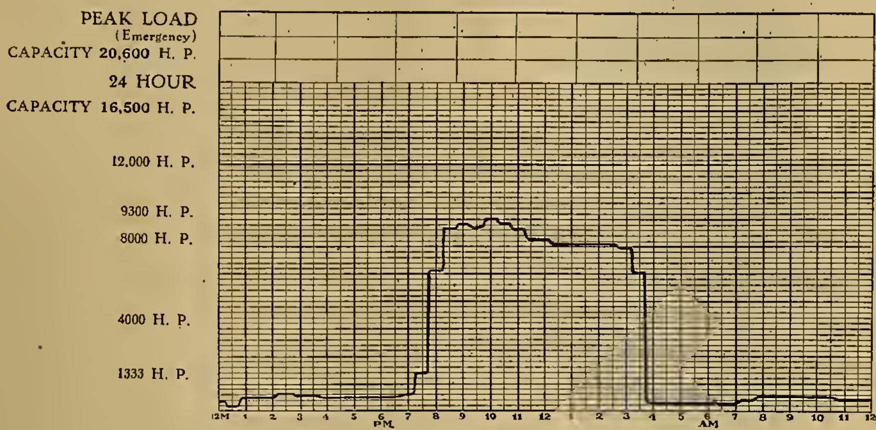
Since about January 1st power generated by the Sanitary District plant has been available for sale, but through the failure of the city to give the necessary co-operation nearly all of it has been wasted. According to Mr. E. B. Ellicott, electrical engineer of the Sanitary District, whose statement we believe to be approximately correct, the Sanitary District has installed at present three generators capable of producing continuously 16,500 horsepower and for peak service 20,600 horsepower. It is now installing two additional generators supposed to be capable of producing continuously 11,000 additional horsepower and with an estimated peak capacity of 13,750 horsepower. Therefore in less than six months the plant should be capable of producing continuously 27,500 horsepower and for peak service 34,350 horsepower.

The flow of water through the channel has, of course, a direct bearing upon the present and future power to be generated. When the channel was first opened the government limited the flow in the river section to one-and-a-quarter miles per hour. The capacity of the river at that point permitted a flow of 250,000 cubic feet per minute without exceeding the velocity of one-and-a-quarter miles per hour. Since that time the river section has been deepened throughout and widened for more than 90 per cent. of its limit, and a flow of 300,000 cubic feet per minute is now possible without violating the government's limitation. Below the river section, the Thirty-ninth Street Intercepting Sewer, with a capacity for supplying 120,000 cubic feet per minute, discharges into the channel, giving a total flow, when the Thirty-ninth Street Pumping Station is in operation, of 420,000 cubic feet per minute. Estimates of the present power are based on this flow.

The future increase of power up to that to be obtained with a flow of 600,000 cubic feet is dependent only on the completion of the work of widening certain sections of the river. This is progressing rapidly, and the remaining 10 per cent. of the work should be completed within two years.

When this is done the Sanitary District should be able to deliver continuously in Chicago at least 30,000 horsepower, and, during a peak load, which is the controlling feature of every power plant, a total of 37,500 horsepower.

At the present time the Sanitary District is supplying to the city and other customers at night about 9,300 horsepower. During the daytime it is selling only about 1,000 horsepower. As it has a continuous capacity of 16,500 horsepower, the estimated waste of power, resulting largely from the lack of cordial co-operation on the part of the city, is at the rate of something like $348,000 a year, or nearly $1,000 a day.



LOAD CURVE OF CHICAGO DRAINAGE CANAL POWER PLANT.

A daily power chart is given herewith. It shows the power actually furnished by the Sanitary District to all its customers, including the city, during each hour of the 24 hours ending at noon on June 23d. This chart corroborates the estimates of the Sanitary District with regard to the present waste, and affords a graphic and impressive illustration of the present enormous loss resulting from the fact that the Sanitary District has been prevented from making arrangements for marketing its output.

With its present facilities the city uses only about 7,000 horsepower of the canal supply for lighting purposes. At the end of two years, if it expends $500,000 in extending its lighting plant, it can add perhaps 6,000 lights, although it has installed only 3,190 new lights in the last four years. It can then use probably 4,500 additional horsepower, making a total of 11,500 horsepower after the proposed expenditure has been made. And this will be used only at night. As the Sanitary District should, within six months, have a capacity of 27,500 horsepower, it is clear that after providing for the lighting needs of the city the Sanitary District should have for sale something like 27,500 horsepower in the daytime and 16,000 horsepower at night. According to Mr. Ellicott, who, by reason of long service as city electrician is familiar with the problem, the proposed addition of 6,000 lights will meet the lighting needs of the city for the next five years. He estimates further that the city can probably never use more than 15,000 horsepower, at night only, for lighting purposes.

The Sanitary District electrical energy is now being furnished to the city at the rate of $15 per horsepower, which is less than one-half what it formerly cost the city to generate its lighting power by steam.

City Electrician Carroll in his report to the finance committee [of the City Council] has dwelt upon the probable loss in Sanitary District power in production and transmission. We are of the opinion that adequate allowance has been made for such loss by the Sanitary District officials in their estimates, which approximate 14 per cent. with a part load and 18 per cent. with a full load.

Regarding criticism of the Sanitary District's present system of distributing electrical energy at a pressure of 12,000 volts, stepping down at the consumer's premises with one step to a pressure of 220 volts, your committee finds that this system is only temporary. It is the intention of the Sanitary District to distribute its power at a lower voltage from sub-stations as soon as it can determine where its sub-stations will be needed to supply customers.

There is no apparent reason why the Sanitary District cannot, within a few years, duplicate its power plant at Hickory Creek, where it is now securing the necessary site by condemnation proceedings. The only obstacle in the way of this plan is the plant of the Economy Light and Power Company at Joliet, which company's lease from the state expires in 1916, after which time the Sanitary District, with the co-operation of the state, will be in a position to install a plant at Hickory Creek and double its output of power.

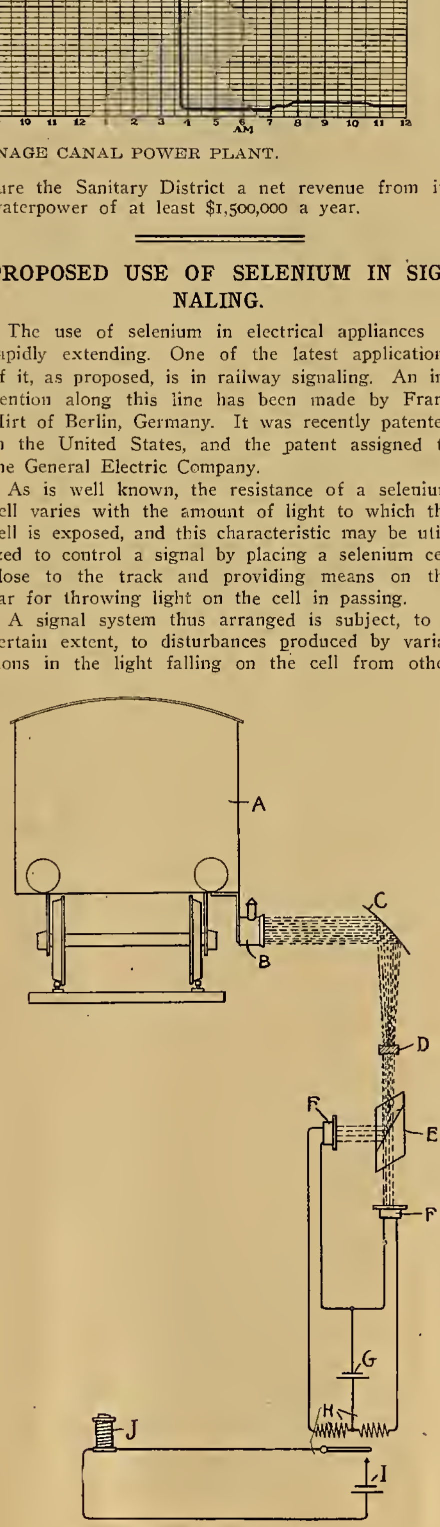
If the Sanitary District is not hampered in the future in its efforts to sell its surplus power, its net income from the sale of power, by the time it has made arrangements for the sale of its whole product, should amount to at least half a million dollars a year. This estimate is based upon the productive capacity, which should be attained within the next six months. With the widening of the Chicago River this income can be largely increased and ultimately, by the development of the power available at Hickory Creek, the total capacity should be increased to 80,000 horsepower, which should insure the Sanitary District a net revenue from its waterpower of at least $1,500,000 a year.

PROPOSED USE OF SELENIUM IN SIGNALING.

The use of selenium in electrical appliances is rapidly extending. One of the latest applications of it, as proposed, is in railway signaling. An invention along this line has been made by Franz Hirt of Berlin, Germany. It was recently patented in the United States, and the patent assigned to the General Electric Company.

As is well known, the resistance of a selenium cell varies with the amount of light to which the cell is exposed, and this characteristic may be utilized to control a signal by placing a selenium cell close to the track and providing means on the car for throwing light on the cell in passing.

A signal system thus arranged is subject, to a certain extent, to disturbances produced by variations in the light falling on the cell from other sources than that of a passing car. For instance, the variation of sunlight during the day may exercise a disturbing influence on the cell and the devices in circuit with it.



SELENIUM RAILWAY SIGNAL.

To eliminate such disturbances the inventor takes advantage of the different effects obtainable from ordinary or unpolarized light and from polarized light. He therefore provides signal-controlling means responsive only to polarized light, and means on the cars or locomotives for throwing polarized light on the signal-controlling devices in passing. By means of this arrangement the signals are freed from outside disturbances.

The accompanying drawing shows diagrammatically a signal system arranged in accordance with the invention. A car or other vehicle *A* is represented carrying a source of polarized light *B*. The polarization may be produced in any well-known manner. As the car passes, the light is caught by a reflector *C* and directed through a lens *D* on the Nicols prism or other double-refracting body *E*. The effect of a Nicols prism on polarized light is, as is well known, to refract unpolarized light in two sets of rays.

In the paths of these two sets of rays are placed the two selenium cells *F F* in circuit with the battery *G*. In series with the cells are placed the opposing windings of a differential relay *H*, which controls the circuit of a suitable source of current *I* and the signal-operating mechanism indicated diagrammatically at *J*.

If the light from the source *B* were unpolarized, or if light from the sun, or any other source, were to fall on the reflector *C*, its rays would be thrown in approximately equal proportions on the two cells, so that the currents in the opposing windings of the differential relay would neutralize each other; but if the light thrown from the source *B* is polarized, then only one set of rays is refracted from the prism *E*, so that light is thrown on only one selenium cell. This produces a difference in the resistance of the two cells, resulting in an unbalancing of the currents in the opposing windings of the differential relay, which is consequently energized, and responds to control the signal.

ELECTRICAL EXPORTS FOR MAY.

During the month of May electrical exports from the United States show a marked falling off as compared with the corresponding month last year and also as compared with April, 1908. The total exports for May, 1908, were valued at $933,202 as compared with $1,419,959 for May, 1907, and $1,153,013 for April, 1908. As classified into appliances and machinery the totals were: Electrical appliances—May, 1908, $464,114; May, 1907, $619,393. Electrical machinery—May, 1908, $469,088; May, 1907, $800,566.

The principal countries to which electrical products were exported during May, 1908, were:

Electrical appliances—British North America, $89,331; United Kingdom, $73,588; Brazil, $69,738; Mexico, $43,869; Central American States and British Honduras, $20,615; other Europe, $28,788; Japan, $26,638; Cuba, $24,951; Argentina, $20,429; other South America, $19,543; Belgium, $9,740; British Australasia, $8,561; Germany, $4,494; other West Indies and Bermuda, $4,180; France, $3,075.

Electrical machinery—Brazil, $142,758; Mexico, $52,713; British North America, $44,772; United Kingdom, $40,261; other Europe, $35,854; British Australasia, $31,282; Japan, $31,277; British Africa, $18,035; France, $12,492; British East Indies, $12,097; Argentina, $10,285; other South America, $8,473; Germany, $6,757; Philippine Islands, $6,506.

TIMES ARE WHAT WE MAKE THEM.

Michigan business men, and others, for that matter, says Chicago Commerce, are subscribing to and passing along the following creed:

First—I will dispel from my mind any thoughts of hard times.

Second—I believe there is more to be gained by push and aggressiveness than by idle talk.

Third—I believe times are what we make them; I will add my influence toward making them good.

Fourth—I will not allow the investment I have in my business to remain idle.

Fifth—I am going to get rid of the old stock and restock with new.

Sixth—I am going to run my business on business principles.

Are you with us?

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

SINGLE-PHASE TRACTION in Great Britain is the subject of an interesting descriptive article from our London correspondent, given in this number. The railway thus operated—the first in the country—is a short branch line of the Midland system, and it will be noticed that the construction is of the thorough, workmanlike character which distinguishes English installations. But it is significant, perhaps, that the overhead work is of German design, generally, while the car equipments are of German and American type.

In electrical work, and speaking in very general terms, Germany may be said to excel in theory, the United States in practice. Great Britain seems to stand midway between the two, without the pronounced advantage of either, moving slowly, grumbling all the time, but yet with a certain dogged robustness and fair-mindedness which compel respect.

THE ANNUAL CONVENTION of the National Electrical Contractors' Association will be held in Chicago next week, and the programme, with portraits of the principal officers, is presented in this issue. In addition there is a timely article from the pen of Mr. Morton, the secretary, which sets forth what the association stands for—its reason for being, its accomplishments and its aims. The writer shows that the association, working with other national organizations in the electrical field, has forced the recognition of the contractor, who is now a factor in the electrical business and in the building industry of no mean importance. In raising the standard of electrical construction, in adopting standard wiring symbols, in investigating the subject of standard specifications and in other directions the National Electrical Contractors' Association has done high-class work of benefit to all electrical interests. Speaking, we are sure, for all the electrical industries of the West, we extend to the association a hearty welcome to Chicago on the occasion of its eighth annual convention.

DENVER is now linked to Chicago by telephone by a circuit which is 1,430 miles long, and conversations were exchanged between the two cities on July 6th. This is the first great extension of long-distance telephone service from the East west of the Missouri River and is a noteworthy accomplishment. The route is by way of Kansas City and Pueblo and is therefore considerably longer than the air-line distance between the two cities. It is proposed to build a direct telephone line from Omaha to Denver at some future time which will shorten the distance to Chicago materially. Denver may now be connected with Boston and New York by telephone, but the distance is great, about 2,400 miles as the wires run, and we are not informed whether talking has been attempted between these extreme points.

The new line—between Kansas City and Denver—is perhaps 775 miles long, and an interesting feature of the account is the statement that an efficient repeater is used at the midway point on this line. Telephone repeaters have not been effective hitherto in increasing the range of long-distance service, although this result has been greatly desired; but it appears that a repeater is actually in use on this new long-distance line west of the Missouri River.

A CURIOUS ADVERTISEMENT appeared in a recent issue of the London Times. It seems that an inventive genius in England has devised a rotary incandescent-filament lamp. Development, to bring the lamp to perfection, is necessary; hence the "ad." The essential idea, protected by patent, it is said, is explained as follows: "By the lightning speed of rotation of the glowing filament set in the lamp to rotate either about its major or minor axis, the utmost pace or rapidity of the eye shown in its effort to form a distinct image, such as that of the filament at rest, is so far outrun by the velocity at which the filament is now rotated that it is thereby spun into the glowing figure of motion, which thus becomes the new image formed upon the retina in place of the incandescent-wire image, the consequent relief to the eye being instantaneous. The size of the figure of motion is magnified and incomparably increased as seen side by side with that of the stationary filament. The glaring coil of dazzling hot wire, as seen in the static lamps, gives place also when rotated at lightning speed, as described above, to a perfectly natural diffusion from the area of the figure of motion; when the distance from this object to the eye of the observer is constant, the photometer records the same light emitted from all points thereon."

The tantalizing thing about this word-picture is that it leaves so much to the imagination. It is not stated of what material the filament is made or how it is made to revolve or how much the operation costs. Furthermore, it would be of interest to know whether the filament revolves in a permanent vacuum; if so, how, and if not, what is the life of the filament? And as lamp filaments are rather fragile, it might be explained why the "lightning speed of rotation" would not shake them to pieces. But, with the airy nonchalance which distinguishes the British no less than the American crank inventor, these questions are left to be answered by the investors—if any present themselves.

A COMPLETE condensed report of the twenty-fifth convention of the American Institute of Electrical Engineers, held in Atlantic City from June 29th to July 2d, inclusive, is given in this issue. A careful reading of this excellent report will give an idea of the wealth of technical material presented and discussed at this meeting. The latest developments in the science and art of electricity were set forth and debated. The electrical student will find information of the highest value in relation to many branches of the art in the proceedings of this convention. General theory, dynamo design, power transmission, electric heating, telephony, "wireless," lightning protection, electric railroading, electrical education and other subjects were discussed. For some reason there was no paper devoted to the new high-efficiency illuminants, nor was there any stated discussion of electric lighting or illuminating engineering. But the programme was long enough —too long, in fact, for several of the papers were inadequately discussed.

The attendance was large for a purely technical convention, and in every way the convention was most successful.

The Institute is the largest, probably the oldest, and, technically considered, undoubtedly the most influential of the electrical societies of the United States. It has grown steadily in size, prestige and usefulness and has played and is playing an important part in the electrical development of the country.

ONE OF THE valuable papers presented at the Atlantic City convention of the American Institute of Electrical Engineers was that of Mr. Ralph D. Mershon entitled "High-voltage Measurements at Niagara." It is the result of an investigation carried on at Niagara Falls more or less continuously for a period of three years and is of much value. The conclusions arrived at by the author will be given in this journal next week. The most important is this: "That with a given conductor at a given spacing and under given atmospheric conditions, there is a certain voltage or 'critical point' at which a very appreciable loss begins to occur through the atmosphere." In the discussion it developed that some engineers were not wholly satisfied of the existence of this "critical point." But if such a point exists, and Mr. Mershon, an engineer who has specialized on power transmission, makes the statement after long and careful observation and study, the fact is obviously of great importance in the planning and operation of high-voltage transmission plants. The paper is one that will arouse the attention of electrical engineers.

Mr. Mershon's paper is also noteworthy for the tribute he pays to those whose generosity made possible the work at Niagara. The contributors were Messrs. J. E. Aldred, Frederic Nicholls, James Ross, George Westinghouse and the African Concessions Syndicate of London. The author says that he wishes that engineering investigations in general might be more often encouraged in like manner and spirit; and this wish will be re-echoed by the entire electrical fraternity, which will add its thanks to those of Mr. Mershon to the patrons of the Niagara investigation.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Twenty-fifth Annual Convention at Atlantic City

The twenty-fifth annual convention of the American Institute of Electrical Engineers, held at Atlantic City, N. J., from June 29th to July 2d, was undoubtedly the most successful meeting ever held by the organization. While the total attendance in point of members was not above the average attendance at the Institute conventions during recent years—there were about 450 members and guests—yet the proportion of prominent and well-known electrical engineers present and active in one way or another at one or more of the sessions was much greater than usual.

Including Louis A. Ferguson, there were present no less than 12 men that have been honored with the office of president. Charles P. Steinmetz, Charles F. Scott, Schuyler S. Wheeler, Henry G. Stott, T. Commerford Martin, Carl Hering, Samuel Sheldon, Louis Duncan, John W. Lieb, Jr., Arthur E. Kennelly and Elihu Thomson—all were there unselfishly engaged in looking after the welfare of what has come to be the largest and probably the most influential national engineering society in America.

Commenting on this interesting feature of the convention at one of the sessions, President Stott said: "As a nation we frequently find ourselves asking, 'What shall we do with our ex-presidents?' As an organization of electrical engineers we ask the same question and then answer it by saying, 'We will make them work for the Institute.' There are ten of them here now, disinterestedly doing this very thing." In addition to this distinguished coterie there were present many men whose names have become household words wherever electrical engineering matters are considered and discussed.

Social Relaxation.

Socially, too, the twenty-fifth annual convention of the Institute was probably the most delightful of all the social affairs in which the Institute has been interested. The reception and dance given at the Casino on June 29th under the auspices of the convention committee was afterward commented on as more of the nature of an informal house party affair than of an open convention dance. Besides this function there were many other social features, such as little dinner parties, teas at the Atlantic City Golf Club, sailing parties and evening informal dances in the pavilion on the Steel Pier.

One feature that combined both engineering and social qualities is worth recording. It was quite unique. Clad in evening dress, about a score of dignified members of the Institute visited Steeplechase Pier. The men personally investigated the coefficients of friction of the "Human Niagara" and the "Shot Tower." Finally they essayed to determine the centrifugal stresses induced by riding on the "Human Roulette Wheel." While the women grouped themselves around the railing the dignitaries scrambled on the whirligig, locked arms, and waited for the thing to revolve. There sat twenty men of international reputation in the engineering world, but the wheel budged not. Someone asked if there were a motor of a certain well-known make operating it, to which a small boy replied in shrill tones, "The professors is stung!" Then the wheel started up, and after a few revolutions arms began to unlock, engineers to slide toward the circumference, and finally shoot off on a tangent terminating in a mattress. All but one well-known engineer of remarkable physical dimensions in a latitudinal way, who, aided by gravity, stuck fast and defied the other natural forces until the management eliminated him with a broomstick.

Work of the Convention.

These little social indulgences were well earned, for the men most active in them were equally active during the sessions at which the 35 papers were read and discussed. There were so many papers of more than ordinary interest and value and the discussions were so animated and protracted that only a brief outline of them can be given here. Some of them will be considered at greater length in subsequent issues. The papers covered approximately 700 pages of the Institute Proceedings, and they were discussed verbally by about 125 men as well as in a number of written contributions. The convention programme was rigidly adhered to by President Stott and the authors of the various papers, though that entailed the presentation of nearly all the papers in abstract. With a few exceptions, all the authors presented their papers in person. The first session began at 11 a. m. on Monday, June 29th, in the music room of the Hotel Traymore, about 300 members and guests being present to listen to the cordial and amusing address of welcome by the mayor of Atlantic City.

LOUIS A. FERGUSON, PRESIDENT-ELECT OF AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

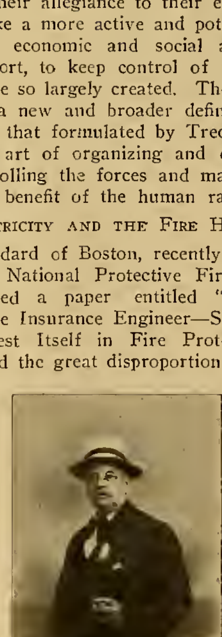
President's Address.

Immediately after the welcoming speech President Henry G. Stott read the president's address, entitled "The Evolution of Engineering." President Stott said that more progress has been made in the engineering world during the last 80 years than in the period of 4,500 years preceding the formulation of Tredgold's famous definition. The progress has been so great and the conditions under which the engineer plies his tasks are now so radically different that Tredgold's definition fails properly to reflect the conditions under which modern engineering practice is carried on.

President Stott made an earnest appeal to engineers in general to be less passive and more aggressive in their allegiance to their engineering societies, to take a more active and potent interest in the political, economic and social affairs of the world—in short, to keep control of the machinery that they have so largely created. The address concludes with a new and broader definition of engineering than that formulated by Tredgold: "Engineering—the art of organizing and directing men, and of controlling the forces and materials of nature for the benefit of the human race."

Electricity and the Fire Hazard.

C. M. Goddard of Boston, recently elected president of the National Protective Fire Association, then presented a paper entitled "Electricity as viewed by the Insurance Engineer—Should the A. I. E. E. Interest Itself in Fire Protection?" Mr. Goddard cited the great disproportion in the annual fire loss per capita in Austria, Denmark, France, Germany, Italy and Switzerland and that in the United States. In the United States this loss is $2.47 per capita per year; in the above-mentioned countries it is 33 cents, or about one-eighth. The fire loss in the United States is chiefly due to carelessness, probably our national characteristic, and electricity may be a most serious fire hazard. Mr. Goddard said further that no small part of the progress of the art of electrical engineering has been due to the fact that in its early days, when the electrical engineer knew little about the fire hazard of electricity, the underwriter, knowing less but fearing much, caused this subject to be carefully considered and guarded against. He then asked for earnest co-operation between the electrical and the fire underwriting interests, so that necessary restrictions should not obstruct but advance and safeguard the electrical undertakings.



SECRETARY R. W. POPE LISTENING TO THE WILD WAVES AT ATLANTIC CITY.

Government Policy in Waterpower Development.

In the absence of Frank G. Baum of San Francisco, his paper was presented in full by Percy H. Thomas of New York, chairman of the meetings and papers committee. Mr. Baum outlined a government policy regarding waterpower development, considering the matter from two points of view—the preservation of the natural resources and the protection of the enterprises. In concluding his paper Mr. Baum said among other things: "The proceeds from any particular privilege cannot be devoted to any other watershed or any other section, or for any purpose except the particular privilege."

In the discussion which followed the reading of these three papers nearly all of it was centered in the sentence quoted above from Mr. Baum's paper. Messrs. Finney, Steinmetz, Jackson, Wells and others contended that Mr. Baum's views are narrow and untenable; that as a matter of governmental policy there would be no more justification for devoting the proceeds of any particular watershed only to that watershed than there would be for administering the proceeds from the New York postoffice solely for the benefit of New York.

President-elect Ferguson's Speech.

Following the presentation of the papers, President Stott introduced President-elect Louis A. Ferguson of Chicago. President-elect Ferguson was greeted with prolonged applause. In an interesting and brief off-hand address, President Ferguson outlined his policy regarding the executive administration of the Institute during the coming year. He said that the welfare of the Institute would undoubtedly be furthered if a larger number of young men could be brought to appreciate the benefits arising from active Institute work; that the Institute's interests would be still further advanced if more men of broad executive training could be induced to give the Institute the benefit of their experience and judgment.

Automatic Telephony.

At the session lasting from two o'clock to five o'clock on Monday afternoon, there were presented two papers on the general subject of telephony, one on measurements of rotary speeds of dynamos and one on electric heating. W. Lee Campbell of the Automatic Electric Company of Chicago presented a paper treating of the large economic waste involved in the wire, cable and conduit equipment of a telephone system. He enumerated the reasons which make this waste necessary or expedient in manually operated systems and expressed his ideas of how this waste may be greatly reduced in systems employing automatic switchboards.

In discussing this paper E. A. Mellinger of Chicago said that virtually the only argument that can now be consistently advanced against the automatic system is the first cost of the apparatus. This is considerably greater for a single automatic exchange than for a single manual exchange, and is frequently the factor of more immediate importance that decides what equipment shall be installed. He said further that sometimes it is difficult to obtain space in a suitable location for the small sub-station serving an outlying district. In one instance this difficulty was successfully met by placing the sub-station underground in a moisture-proof cement vault, similar to those used for housing batteries in railway signal work. A manhole could be used for this purpose, constructed so as to accommodate the switching apparatus, and this would do away with the necessity for building space. From the underground sub-station to the underground branch exchange is not a long step, and although the branch office usually requires one or two attendants, the ventilating and lighting problems of an underground branch exchange could easily be solved. Considerable economy could be effected by installing such an arrangement in the business center of a large city, thus hastening the expansion of the automatic telephone system.

Wireless Telephony.

In the absence of Reginald A. Fessenden of Washington, D. C., A. E. Kennelly of Boston presented the former's paper, entitled "Wireless Telephony." An abstract of this paper is given on page 32 of this issue. In abstracting the paper, Dr. Kennelly made numerous running comments, particularly in regard to the receiving apparatus, the transmission and the great obstacle to long-distance wireless telegraphy and telephony—atmospheric absorption. It was stated that the amount of power necessary for wireless telephony may therefore be taken as approximately five to fifteen times that necessary for wireless telegraphy.

Measurement of Rotary Speeds.

Dr. Kennelly then presented a paper entitled "The Measurement of Rotary Speeds of Dynamo Machines by the Stroboscopic Fork," written by himself and S. E. Whiting. In abstracting this paper, Dr. Kennelly said that the stroboscopic fork has been known and used by physicists for some time, but has only recently been employed for measuring the speeds of dynamo-electric machinery. An early type of this instrument was devised by Dr. Charles V. Drysdale of London, employing a conical roller device. This instrument was not portable. Dr. Kennelly exhibited a portable stroboscopic fork devised by himself and Mr. Whiting and put it into operation to illustrate his remarks. In this modified form of fork the rate of vibration can be varied through a range of about five per cent. above or below the mean value of 1,800 peeps per minute. The fork is driven by an electromagnet, receiving energy from a small dry cell. By means of a target containing five disks, with from 4 to 18-point patterns, the fork, at its normal speed, will indicate from one-half to one-eighteenth of synchronous speed.

In discussing this paper, Messrs. J. B. Taylor, Clayton R. Sharp and Prof. C. A. Perkins described stroboscopic devices used by them for similar purposes.

Heating Plant at Biltmore.

Charles E. Waddell then briefly abstracted his paper relating to the heating plant of the Biltmore (Vanderbilt) estate in North Carolina. He gave the reasons for the substitution of electricity for fuel and presented an account of the experiences with the plant at Biltmore. All laundry apparatus works interchangeably on direct or alternating current. The house is heated by hot water circulated by gravity. In the discussion on this paper, in answer to questions asked, Mr. Waddell said that the electric energy could be bought at 0.8 cent per kilowatt-hour, but even at this low rate the cost of the heat by electric means was considerably more than that required by the furnace. But the furnace required more attendants than the electric heater, and there were none of the annoyances usually found with coal and ashes.

Lightning and Lightning Protection.

Perhaps the most important session of the convention was that of Tuesday morning. At this session there were presented three papers on the general subject of lightning phenomena and its control by Prof. E. E. F. Creighton of Union University, Schenectady, Ernst J. Berg of Schenectady and Percy H. Thomas of New York. Those competent to express a valuable opinion pronounced Mr. Creighton's paper a classic on this important branch of electrical engineering—a subject that has been constantly before the Institute for the last 10 or 15 years. Mr. Creighton's paper gave a report in detail of the study of lightning and the operation of lightning arresters during the last year on two lines well up in the Rocky Mountains of Colorado. These experiments were supplemental to laboratory experiments carried on during the last two years. The paper described the instruments and methods used in the measurements of duration, potential, current, frequency; also the resistance of cement under the heating effect of dynamic current, as well as the results of other closely related tests. The subject-matter of the paper was considered under six general heads: (1) Characteristics of lightning; (2) subdivision of frequency; (3) miscellaneous observations; (4) general comments on the arrester equipment of the Animas company; (5) earth connections, and (6) cement as a resistor. It should be noted in passing that Mr. Creighton prefers to coin a new word "resistor" to distinguish a contrivance from one of its attributes. He chooses to say "The resistance of the resistor" rather than "The resistance of the resistance." The six general heads referred to above were further subdivided into 51 specific heads, each one of which Mr. Creighton treated exhaustively. These brief references will give an idea of the nature and extent of this valuable treatise.

Mr. Berg's paper contained a description of a number of tests with arcing grounds, which were undertaken with the hope of being able to deduce therefrom some mathematical expression which would represent these phenomena with reasonable accuracy. Though the mathematical expression did not materialize, the results of the tests are evidently of interest and value. The author's conclusions are that with increasing line voltages it may be desirable to resort to some new methods of protecting the winding of transformers and other apparatus connected to high-potential lines.

Mr. Thomas presented a paper involving a critical study of the paper by J. F. Vaughan on the "Lightning Records on the Taylor's Falls Transmission Line," presented at a meeting of the Institute in New York last May. After a somewhat exhaustive study of the tell-tale and other records presented by Mr. Vaughan, Mr. Thomas concluded that whether protection can be obtained from overhead grounded wires depends entirely on the arrangement of wires, the frequency of grounding, etc. Little protection is obtained from lightning rods located beside the line. Station arresters of the best types should, in the absence of severe discharges close to the station, protect adequately the station apparatus if properly insulated. Horn arresters as installed at Taylor's Falls with some paths to ground without adequate series resistance are not non-arcing and can be relied upon occasionally to shut down the plant. Both the electrolytic and the low-equivalent arresters showed themselves properly non-arcing. Finally the size of the punctures in tell-tale papers produced by the discharge of one of the waves of static after passing along the line does not in the worst case exceed a very few hundredths of an inch in diameter, while the disturbances striking the line directly caused much larger punctures.

The discussion on these papers was valuable and protracted. Many of the recognized authorities on lightning phenomena and lightning arresters were at the meeting or sent communications by letter referring to the conclusions arrived at by the several authors. Messrs. McClellan, Fraser, Steinmetz, Thomas, Neall, Vaughan, Lincoln, Osgood, Taylor, Creighton, Rushmore, Berg and Kennelly contributed in one way or another to this informing discussion. The consensus of opinion seemed to be that the most satisfactory general solution of the elusive lightning-arrester problem lies in the proper use of the overhead grounded wire.

Dr. Kennelly's summary was so concise and so illuminating that it is given here virtually verbatim. He said: "It is my expectation that we shall never have any system of absolute, complete protection against lightning, even with the best devices we can install in the station or the most perfect system of overhead grounded wire that can be devised. We shall always have some trouble left. Anyone that looks for a complete panacea against lightning is taking a very high position, which is apt to meet with some discouragement. Mr. Thomas, apparently, thinks that the disturbances are due largely to one cause, while others are equally sure that direct strokes are subordinate to inductive disturbances. The sources of lightning trouble are numerous and varied. I believe that we should not attempt to formulate a rule and declare that all disturbances in overhead transmission wires have one and the same origin. We must expect that with a number of disturbances a number of different kinds of protective apparatus will have to be installed, each bit of apparatus to look after the kind of disturbance to which it is best adapted."

In a written contribution discussing Mr. Thomas' paper, J. F. Vaughan of Boston said that Mr. Thomas believes that the more pronounced disturbances have been due to some form of direct discharge between clouds and line; but as a matter of fact no clouds have been observed sufficiently low and close to the ground to account for short direct strokes, nor have any spill-overs been actually seen. Close watch is being kept on the Taylor's Falls (Wis.) line this summer to get information on the appearance of clouds and line during spill-overs, and the nature of insulator breaks is being further studied.

In the course of his remarks on these papers, Dr. Steinmetz said that as many valuable tell-tale papers were undoubtedly destroyed by fire caused by the lightning discharge, perhaps it would be advisable to make the tell-tale papers fireproof by saturating them with a solution of tungstate of sodium.

John B. Taylor, after commenting on the value of the overhead grounded wire as a lightning arrester, branched off and discussed the nomenclature adopted by both Mr. Creighton and Mr. Thomas. Mr. Taylor thought that the use of the word "lightning" to indicate anything abnormal in a transmission line was confusing; he believed that the definition of lightning should be more restricted, in accordance with common usage. Mr. Taylor also objected to the use by Mr. Thomas of the word "static" as a noun to indicate any condition other than a state of rest.

William McClellan said that the subject of lightning protection is a two-part problem—the station and the line. The station apparatus can be protected by one means or another—choke-coils, various types of arresters, extra end-turns on transformers, etc.—but the real problem is to protect the line. If the line could be equipped with the same sort of protective apparatus that is found in the stations, much of the trouble would be eliminated.

In discussing these papers, J. W. Fraser of the Southern Power Company, Charlotte, N. C., said that in addition to grounded wire over both steel and wood pole lines, the company had installed last autumn and this spring 14 aluminum-cell arresters at various points on the lines. Several severe storms have passed over different parts of the lines since these arresters were put into service. The arresters seem to be doing good work. Although there are 315 miles of 44,000-volt line with 98 transformers, and 50 miles of 11,000-volt line with 48 transformers in service, only one transformer has been lost by causes traceable directly to lightning.

It has been the intention of the Southern Power Company to make a systematic study of lightning and freak voltages, but so far all that has been done is to keep an accurate log of all disturbances on the lines since January 1, 1908. Out of the 21 lightning storms that have passed over the lines since that time, 18 were severe and three were moderate. Out of eight storms there was no damage of any kind. Out of five storms a total of a dozen insulators had either one or two petticoats broken off. In two storms two meters were damaged. In two storms one leg of three 44,000-volt oil switches was punctured. In one storm one 2,200-volt oil circuit-breaker blew up. In one storm transformer leads burnt off two transformers inside the case. In two storms the line grounded through a punctured insulator and did considerable damage.

Hydro-electric Engineering.

Mr. Fraser then presented a paper giving the conditions under which a successful hydro-electric power system can be created: (1) A sufficient source of power; (2) a market for the sale of power within economical transmitting distance; (3) the necessary capital. He then described in detail the conditions relating to the sale of power that determined the design of the systems of the Southern Power Company. It was considered that 44,000 volts was preferable to a higher pressure, because the distance over which the power is transmitted is so limited that the saving in copper by raising the pressure would be more than overcome by the extra cost of the apparatus for generating a higher electromotive force. The first motor installations in cotton mills on this system were of 550 volts, but it was soon seen that the number of small transformer sub-stations, besides complicating operation, would cost excessively, and after some investigation 2,000-volt motors were recommended. To-day more than one-half the total horsepower in motors is at 2,000 volts.

Owing to the late hour the discussion on this paper was curtailed. Mr. Thomas, however, said that Mr. Fraser deserved the thanks of all the members of the Institute for discussing so frankly the conditions under which the Southern Power Company's system was installed and operated.

Three-phase Power Factor.

In the absence of Austin Burt of Waterloo, Iowa, his paper, entitled "Three-phase Power Factor," was presented in abstract by Mr. Thomas. The author derives from the various relations that exist between the electromotive forces and currents in a three-phase, delta-connected system a general expression which will enable the mean power factor to be determined exactly; and secondly, he develops a method by which the required values employed in the above expression may be readily determined from the standard switchboard instruments.

High-tension Transmission.

At the evening session of Tuesday papers on high-tension transmission matters were presented by Ralph D. Mershon of New York, D. R. Scholes of Chicago and C. E. Skinner of Pittsburg.

Mr. Mershon's paper contains a brief historical account of the investigation of the phenomena existing when transmission-line conductors are subjected to high alternating voltages made by him near Telluride, Colo., in 1896-7, and at Niagara Falls from 1904 to 1907. A summary of this paper will be given in a later issue.

Mr. Scholes was not present, so his paper was presented in abstract by Mr. Mershon, chairman of the high-tension transmission committee. Mr. Scholes' paper contained a discussion of certain basic considerations relating to the design of transmission-line structures. The author treated his subject under the general heads of wind pressure on structures; factor of safety; wind pressure on cables; sleet; accidents, as breaking of wires, etc.; foundations. Towers should resist a wind pressure of 40 pounds per square foot on their members, allowing a factor of safety of from 1.5 to 2. The wind pressure on cables of long spans should not be less than 30 pounds per square foot for localities where the winds are known to be high. A factor of safety of 2 should be used here. Provision should be made against a coating of ice on the cables at least one-half inch thick in combination with a factor of safety of not less than 2, based on the ultimate strength of the conductor.

Mr. Skinner presented a paper containing proposed standard specifications for the testing of high-voltage line insulators. The specifications embody information and suggestions gleaned from a large number of domestic and foreign manufacturers and porcelain insulator users. Mr. Skinner considers the subject under three general heads: (1) Routine tests; (2) design tests; (3) methods of making tests. The subject of routine tests is subdivided into two parts: (1) Inspection; (2) dielectric tests. The subject of design tests is subdivided into four parts: (1) Mechanical tests; (2) routine tests; (3) rain tests; (4) dew test. The subject of methods of making tests is subdivided into five parts: (1) Mechanical test; (2) dielectric tests, dry test; (3) rain test; (4) frequencies, and (5) voltage control.

Presentation to Mr. Scott.

Before opening the discussion on these papers, President Stott announced that at a meeting of the board of directors on February 4, 1908, there were adopted resolutions of appreciation of the work done by Past-president Charles F. Scott of Pittsburg in connection with the inception, construction, completion and administration of the Engineers' Building in New York. Before the entire convention assemblage in the meeting hall Past-president Samuel Sheldon of Brooklyn then presented Mr. Scott tastefully engrossed and framed resolutions, reproduced in facsimile on this page.

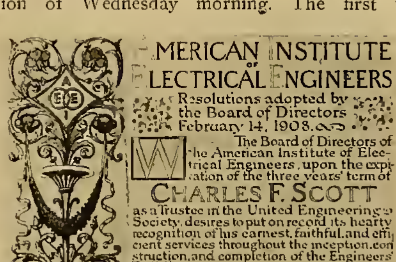
With characteristic modesty and gentleness, Mr. Scott acknowledged this honor in a few earnest, well-chosen words.

Discussion on High-tension Paper.

Past-President Elihu Thomson opened the discussion on the high-tension papers, confining his remarks chiefly to the conclusions drawn by Mr. Mershon In general, Mr. Thomson agreed with Mr. Mershon. Past-President Samuel Sheldon discussed Mr. Mershon's paper from a theoretical point of view. Dr. Steinmetz did not agree with Mr. Mershon in regard to the "critical point," asserting that this point would be at a voltage considerably higher than that mentioned in the paper. Percy Thomas considered the subject of high-voltage measurements from two points of view—its scientific interest, and its value in connection with commercial transmission work. A number of other men took part in the discussion on Mr. Mershon's paper, all the remarks, however, focussing on the two parts of the paper that relate to the generosity of Mr. Mershon's patrons, and the critical point in the curve connecting loss and voltage at which the loss begins to increase rapidly. Written communications on the papers by Messrs. Scholes and Skinner were received from N. J. Neall of Boston.

Discussion of Wave Form.

Seven papers were presented and discussed at the session of Wednesday morning. The first two,


AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Resolutions adopted by the Board of Directors February 14, 1908.

Whereas, The Board of Directors of the American Institute of Electrical Engineers, upon the expiration of the three years' term of

CHARLES F. SCOTT

as a Trustee in the United Engineering Society, desires to put on record its hearty recognition of his earnest, faithful, and efficient services throughout the inception, construction, and completion of the Engineers' Building:

Resolved, That to Mr. Scott's engineering experience, his watchful care, and his thorough appreciation of the requirements of the future as well as of the present, and especially to his controlling influence in thus bringing about the full realization of a plan which at the outset seemed only visionary, the electrical engineers of America are and will for all time be indebted.

Resolved, That the American Institute of Electrical Engineers hereby tenders its sincere thanks to Past-President Charles F. Scott for his devotion to its interests throughout his term as a representative upon the Joint Building Committee, and upon the Board of Trustees of the United Engineering Society.

Resolved, That this preamble and these resolutions be spread in full upon the official records of this Board, that they be printed in the Proceedings of this Institute, and that a suitable copy be presented at a future meeting of this Institute, to Past-President Charles F. Scott.

RESOLUTIONS IN HONOR OF MR. SCOTT.

the "Voltage Ratio in Sychronous Converters, with Special Reference to the Split-pole Converter," by Comfort A. Adams of Cambridge, Mass., and the "Application of Storage Batteries to the Regulation of Alternating-current Systems," by J. Lester Woodbridge of Philadelphia, excited the most interest. So much time was consumed by the discussors of these two papers that there were only a few moments left in which to abstract and discuss the remaining five. The papers by Messrs. Adams and Woodbridge had so much in common that they were discussed jointly.

Paul M. Lincoln of Pittsburg opened the discussion by saying that in both papers practically the only question discussed, so far as the split-pole rotary is concerned, is that of wave form. He said, further, that the matter of wave form is by no means the only one which is to determine whether this type of apparatus will stand the test of time, or find its way into the oblivion of the monocyclic system and "similar skeletons of former hopes." Mr. Lincoln said that the split-pole method of obtaining a variable voltage must be compared with other methods of obtaining the same results, not only with respect to wave form, but also with respect to relative capacity, cost, efficiency, commutation, power factor, weight, floor space, heating, reliability, noise, resonance, rapidity of voltage change, liability of hunting, etc. Mr. Lincoln then referred to his previous discussion on this subject before the Institute last February, and said that his statement, "With a field form other than a sine, the wave form across the electrical diameter deviates from sine form less than that across any chord," though perfectly true for the general case, does not apply to the case of the rotary converter as ordinarily constructed.

Mr. Lincoln then took up the subject of wave form and dwelt at length on the fundamental form and the various harmonics, and concluded by saying that this type of rotary is effectually barred from Edison three-wire circuits where the neutral is brought out from the transformers and connected to the neutral of the lighting system. He declared that any attempt to use the machine in this service would superpose the third harmonic upon the direct-current circuit, and also cause circulating currents in the transformer windings if more than one transformer were tapped into the neutral. He then took up in detail the matters of capacity, costs, commutation, etc.

In discussing "resonance" Mr. Lincoln said that the large capacity in long-distance transmission systems, taken in conjunction with the reactance of the transformers, presents the possibility of resonance. He said, further, that although the three-phase connection of a split-pole rotary eliminates the third harmonic and all multiples thereof, Professor Adams' paper shows that all other harmonics appear in the system to exactly the same extent in the 120° electromotive force wave as in the 180° wave. In concluding, Mr. Lincoln said that in his opinion the split-pole rotary has disadvantages that far outweigh its advantages.

Dr. Charles P. Steinmetz then took up the discussion and considered, step by step, all of the many arguments advanced by Mr. Lincoln. With the aid of blackboard diagrams he discussed for fully three-quarters of an hour the design of the split-pole rotary converter. This lecture is merely referred to here; it may be published in full, with accompanying diagrams, in a later issue. Dr. Steinmetz said, in concluding, that the mathematical, fictitious, imaginary third harmonic vanishes somewhere in this machine; it does not exist between the primary lines.

W. L. Waters of Milwaukee said that the use of storage batteries to take care of peaks on an alternating-current system is entirely a question of cost. He added that though Messrs. Adams and Woodbridge had worked out in an interesting way the mathematical theory of the split-pole rotary, showing that it is possible to attain a considerable voltage variation without introducing serious distortion of wave form, he doubted whether this would be strictly true in practice. He said that the electrostatic capacity between the different parts of the armature winding and frame causes local higher harmonic circulating currents and a tendency for the higher harmonics to reappear in the voltage wave form. Mr. Waters said that a booster combination is more flexible, quicker acting, and introduces no distortion or circulating currents into the system, and that the split-pole rotary at the present time can only be considered as a theoretical proposition, as something to be considered in special cases where its peculiar disadvantages are not liable to be serious.

Dynamo Design.

Following the protracted discussion on these two papers, B. A. Behrend of Milwaukee briefly abstracted his descriptive paper entitled "A New Large Generator for Niagara Falls." W. L. Waters abstracted his paper on "Modern Development in Single-phase Generators," and Jens Bache-Wiig abstracted his paper on the "Application of Fractional Pitch Windings to Alternating-current Generators." These papers, being somewhat special in character, and of interest chiefly to the designing engineer, the discussion was not of general interest. Messrs. Rushmore, Foster, Steinmetz, Jackson and Waters participated. Mr. Waters made some comments on Mr. Behrend's paper, to which Mr. Behrend declined to reply.

Steam Turbines and Gas Engines.

J. R. Bibbins of Pittsburg then abstracted his two papers—"Double-deck Steam-turbine Power Plants" and "Working Results from Gas-electric Power Plant." The latter will appear in full in a later issue of the Western Electrician. Owing to the lateness of the hour—it was almost 1:30 p. m.—C. W. Ricker of Cleveland was the only discussor. In his discussion he gave a complete, detailed analysis of the cost per kilowatt of the West Point power station of the Youngstown and Ohio River Railroad. The total cost of the 3,000-kilowatt power station was $246,170, or $82.06 per kilowatt. The total cost of the sub-station equipment in the power station was $12,600, or $4.20 per kilowatt. The total cost, then, of the station and sub-station was $258,770, and the total cost per kilowatt was $86.26.

Electric Railways.

The session on Wednesday afternoon was devoted to the general subject of electric railways. Four papers were presented in abstract by J. B. Whitehead of Baltimore, H. C. Specht of Pittsburg, Gerard B. Werner of New York and S. B. Fortenbaugh of Schenectady. In the absence of Mr. Fortenbaugh, his paper was presented by Mr. Thomas.

Professor Whitehead's paper described the Annapolis Short Line, a line 25 miles long, which is to be changed from steam to electric operation. Detailed estimates, given in the paper, indicate that the total cost of electric operation and maintenance is about 16.6 per cent. more than that under steam operation. A 25-cycle, 6,600-volt system has been selected, power being obtained from single-phase generators. The trolley is fed directly from the generators, as are also step-up transformers for the 17.5-mile transmission to the sub-station.

In discussing this paper A. W. Copley gave some valuable tabulated results of tests made on the New York, New Haven and Hartford Railroad under the direction of Charles F. Scott and W. S. Murray. Mr. Copley referred to the figures given by Mr. Whitehead for various losses in railway circuits, figures compiled by Messrs. Parshall and Hobart and by the Railway Test Commission, and Mr. Whitehead's theoretical considerations thereof. He then compared these data with those obtained by him during the New Haven road tests, taking them up under the specific heads of rail impedance, rail resistance, rail reactance, rail current, position of earth current, impedance volts due to trolley current and impedance volts due to rail current.

Mr. Specht presented a paper treating of the operation of two induction motors connected in direct and differential concatenation and as single machines for the purpose of obtaining variable speed.

Mr. Werner's paper was entitled "The Determination of the Economic Location of Sub-stations in Electric Railways." The specific purpose of the paper was to develop an equation for the number of sub-stations, or the distance between sub-stations, which will render the total annual charges on the station a minimum. Mr. Werner elected the single-phase system to illustrate the general method of deducing the equation, and the charges considered were the annual charges on sub-stations, on overhead copper, cost of sub-station losses, and secondary-conductor losses. Developing the formula and plotting the curves, Mr. Werner showed that the lowest point of the curve of the total charge corresponds to that number of sub-stations at which the curve of sub-station charges crosses the curve of charges on the secondary copper.

Mr. Fortenbaugh's paper was on "Conductor Rail Measurements." It contained a summary of tests made on the third and fourth rails of the Metropolitan District Railway and the Baker Street and Waterloo Railway in London. Mr. Fortenbaugh's conclusions were:

1. That the difference of potential between the positive conductor and earth is always normally considerably greater than the potential existing between the negative conductor and earth.
2. That this difference between the positive and negative insulation becomes more marked the longer the conductors are subjected continuously to a difference of potential in the same direction.
3. That a reversal of the polarity is always instantly accompanied by a considerable increase in the normal leakage current between the positive and negative conductor.
4. The above phenomena can be repeated indefinitely and are independent of the length of time that the pressure has been previously applied to the conductors in either direction.
5. That the insulation of the negative conductor to earth cannot be proportionately maintained.

The discussion on these papers was of a general nature, so that no specific mention need be made of it. As usual, however, the advocates of the various systems—the 600-volt direct-current, the 1,200-volt direct current, the 25-cycle, single-phase alternating current, and the multiphase alternating current—all contended for their particular system. The 1,200-volt, direct-current system seemed to have gained friends during the last twelvemonth.

Sections and Branches.

One of the most interesting features of the convention was the large, enthusiastic and interesting meeting on Wednesday evening, of the representatives of the sections and branches. Representatives from the Chicago, Cleveland, Minnesota, Pittsburg, Seattle, Cincinnati, St. Louis, Baltimore, Boston, Urbana, Atlanta, Ithaca, Toledo, Norfolk, Philadelphia, Schenectady, Pittsfield, San Francisco, Columbus, Toronto and Washington, D. C., sections and from numerous colleges and universities were present to discuss the administrative work of the Institute from the point of view of their section or branch. The wide geographical distribution of these sections and branches and their activity in Institute affairs stamp the Institute as distinctively national. No other national American engineering society begins to approach the Institute in this respect. Previous to the establishing of the sections and branches it was impracticable to get a consensus of opinion regarding the details of Institute administrative work from the members in any particular locality or group of localities outside of the New York district. The informal meeting was presided over by Paul Spencer of Philadelphia, chairman of the sections committee. At this meeting Mr. Spencer invited free and full expressions of opinion from all the representatives present, asking particularly for practical suggestions for closer working relations between the sections and branches and Institute headquarters. An interesting discussion, lasting from 8 to 11:30 p. m., followed this invitation.

General Equations of the Electric Circuit.

Six papers were presented at the session of Thursday morning. Dr. Charles P. Steinmetz abstracted his classic paper on "The General Equations of the Electric Circuit," stating that the paper is still incomplete and may require some modifying; that the paper represents an attempt to investigate mathematically the phenomena that may occur in the most general case of an electric circuit, and that the general equations of the electric circuit can be derived under the condition that the attributes of the electric circuit—resistance, inductance, conductance and capacity—are constant. He then proceeded briefly to derive and discuss these equations by means of blackboard diagrams, devoting the larger part of his discourse to an analysis of traveling waves and oscillations.

In opening the discussion on this paper, President Stott said that the subject is so important and so complicated and abstruse that justice could not be done to it at one meeting; that its consideration should extend over a series of meetings. Dr. Bedell of Ithaca, N. Y., thought that a paper of this character should be presented at one convention and discussed at the next one. Prof. Dugald Jackson of Boston commented on the simplicity of Dr. Steinmetz's equations, adding that these equations actually represent the facts. He commented on the almost total disregard of imaginary quantities in arriving at the results obtained. After discussing somewhat at length the purely mathematical features of the paper, Professor Jackson said that Dr. Steinmetz is the first man that has had the courage to make a direct attack on this abstruse and involved subject. Prof. John Price Jackson of State College, Pa., followed with an amusing and highly imaginative hydro-mechanical analogy of the paper, evolved the night before, he said, in the effort to get at a physical conception of the actual facts.

Primary Standard of Light.

Following this, Dr. Steinmetz presented in abstract his paper entitled "Primary Standard of Light." This paper was discussed by Clayton Sharp, J. B. Taylor, E. B. Rosa, C. P. Steinmetz, C. A. Perkins, A. E. Kennelly and E. P. Hyde. Mr. Taylor expressed surprise at Dr. Steinmetz's versatility, but wondered why wave lengths are used in making comparisons in the case of either light or sound; wave lengths are different in different media, he said; one thing in wood, another in water, another in air, and still another in hydrogen. He thought that comparisons of frequency would be more rational in matters of this sort.

Electromagnetic Induction.

Dr. Carl Hering of Philadelphia then abstracted his paper entitled "An Imperfection in the Usual Statement of the Fundamental Law of Electromagnetic Induction." As this paper and the written discussion on it had already been published in the Proceedings, there was no further discussion at the convention.

Graphical Treatment of the Rotating Field.

R. E. Hellmund of Pittsburg abstracted his paper, entitled "Graphical Treatment of the Rotating Field," saying that the object of the paper was to evolve diagrams by means of which nearly all the phenomena of the rotating field may be easily studied. He considered numerous points in electrical machine design, such as fluxes in the individual teeth, space values of the total field, potentials, characteristics of the rotating field, reactance factor, etc., treating them all graphically. He said that the graphical treatment always gives clearer conceptions of physical facts than can be obtained from analytic formulas.

Solution of Alternating-current Problems.

In the absence of Harold Pender of New York, Percy H. Thomas presented in abstract the paper entitled "A Minimum-work Method for the Solution of Alternating-current Problems." An abstract of this paper will be given in a succeeding issue. In discussing this paper, Mr. Thomas said that to him the actual value of the paper as a saver of work lay rather in the tables given than in the method adopted by the author. Professor Comfort Adams thought that short-cut methods of this nature are of interest to comparatively few people; compared with natural methods, said Professor Adams, they are of but little value to the student.

Copper and Iron in Alternators.

The last paper of this session, "The Relative Proportions of Copper and Iron in Alternators," was presented by Carl J. Fechheimer of Cincinnati. In abstracting this paper, Mr. Fechheimer said that a problem constantly before the electrical engineer is, how shall the flux and number of conductors be related to each other, the product of these two being fixed by the voltage, frequency, and speed? In the method pursued by Mr. Fechheimer, equations are derived for the weights of the principal parts of the alternator, the weight in each case being expressed as some factor which is easily determined, multiplied by some power of the flux per pole. The weight of these parts is then multiplied by the price per pound of material used and by some other factor to allow for the unavoidable scrap material. The sum of these costs will give the cost of the material in the principal parts of the machine in terms of the flux. The method is only an approximation, but the author believes it sufficiently accurate for commercial purposes. The paper concludes by applying the method proposed to the design of a three-phase, 60-cycle alternator.

In discussing this subject, W. L. Waters said that this paper is perhaps useful in an academic way to beginners and students, but for practical purposes designers will have to stick to the old methods formulated by experience.

Training of the Electrical Engineer.

At Thursday afternoon's session three papers on the general subject of the training of the electrical engineer were presented by M. W. Alexander of Lynn, D. B. Rushmore of Schenectady and B. A. Behrend of Milwaukee. The papers by Messrs. Rushmore and Behrend were general in their nature; the paper by Mr. Alexander described specifically a purported co-operative method of training engineers so as to increase their efficiency. According to the plan proposed, which is about to be adopted by a large electrical manufacturing company and one of the leading technical schools, the student is to spend six years in gaining technical education and factory experience. In the method proposed the student spends the first five years in alternate periods at the college and at the factory, the sixth year being confined exclusively to college work. The length of the alternating period is an important element in this plan, for too long or too short a time may defeat the objects which the alternating, co-operative course seeks to accomplish.

This paper was discussed somewhat vigorously and at length. So intent were the debaters on centering their opinions on the alternating feature of Mr. Alexander's paper that they quite forgot the other two educational papers. Prof. John Price Jackson argued for more culture studies in the course, and suggested that practicing engineers should become "consulting professors," and said, further, that until the practicing engineers agreed to do this the colleges could not do the work that the engineers want them to do. Mr. Behrend criticized Mr. Alexander's alternating plan on the ground that one week here, one week there, would teach the student anything but concentration. Percy H. Thomas of New York and Prof. Morgan Brooks of Urbana, Ill., were skeptical regarding the result of having the student alternate during his college training between the desk and the machine.

Dr. Steinmetz discussed the subjects of education and training at length. He said that the university labors under a great disadvantage in attempting to make electrical engineers out of all the mediocre material that is dumped on it. He thought that there should be different kinds of engineering schools. Prof. Dugald Jackson supported Mr. Alexander's alternating co-operative plan. He compared the educating and the training of the engineer with that of the physician, who alternates between the classroom and the clinic, and thought that Mr. Alexander's plan would make the training of the engineer approach more closely to that of the physician.

Charles F. Scott and Gano Dunn argued for the broad development of the man himself, considering the methods adopted as of secondary importance. Mr. Dunn was opposed to Mr. Alexander's scheme on the ground that the average student has but little directive force and needs to be taught to confine his attention insistently upon one thing. Mr. Dunn said that an asset of great importance in a factory is a trained workman, and to have students one week on and the next week off would soon spell chaos in the organization of the factory. "The keynote to better, higher education," he concluded, "is the selective process, not only among the students but among the professors as well. The teacher should have the dramatic power to arouse thought that will be retained vividly in the mind of the college student long after he has been graduated."

In bringing the convention to a close, President Stott spoke of the obligations of the Institute to its various committees, committees that sacrifice both time and money in order unselfishly to advance the interests of the profession. He said that the secret of the remarkable success of the Institute lies not in the kind of help that can be had for hire, but in the voluntary work of the committees, particularly the committees on finance, papers and meetings, editing, and membership.

Resolutions were then passed thanking the convention committee, the Philadelphia Section and President Stott for their labors in bringing to a fitting close the most successful year in the history of the Institute.

As noted previously, the total attendance was about 450. Of this number the following-named persons were registered from points west of Pittsburg: Louis A. Ferguson and Mrs. Ferguson, George A. Damon and Mrs. Damon, G. R. Brandon and Mrs. Brandon, H. R. King and Mrs. King, W. Lee Campbell, E. A. Mellinger, R. F. Schuchardt, Chicago; Prof. Morgan Brooks, J. M. Bryant, E. H. Waldo, Urbana, Ill.; W. S. Lee and Mrs. Lee, E. P. Coles, J. W. Fraser, Charlotte, N. C.; Fred G. Simpson, John Harisberger, Seattle, Wash.; John H. Rogers, Kansas City; A. W. Berresford, Charles E. Lord, B. A. Behrend, A. B. Field, L. E. Bogen, C. T. Henderson, O. M. Rau, Max Palitz, C. R. Gilman, Milwaukee; F. W. Springer, Minneapolis; John H. Finney, Atlanta; Clarence E. Delafield, Mansfield, Ohio; A. H. Babcock, San Francisco; H. L. Wallau, J. C. Lincoln, C. W. Ricker, H. B. Dates, Cleveland; Allan Ramsey, A. H. Timmerman and Mrs. Timmerman, C. R. Meston, A. S. Langsdorf, St. Louis; Joseph F. Merrill, Salt Lake City; Carl J. Fechheimer, A. C. Lanier, Cincinnati; L. E. Hurtz, Lincoln, Neb.; George H. Duffield and Mrs. Duffield, Rock Island, Ill.; P. E. Mitchell, Charles A. Perkins, Knoxville, Tenn.; Alexander O'Shea, Charleston, W. Va.; H. A. Holdrege, O. S. Hoffman, A. Rosewater, S. Rosewater, Omaha; George E. Kirk, Toledo, O.; R. F. Garrettson and Mrs. Garrettson, Michigan City, Ind.; Prof M. C. Beebe and Mrs. Beebe, Madison, Wis.; J. McA. Stevenson, San Antonio, Tex.; G. Wilbur Hubley, Louisville; P. N. Nunn, Provo, Utah; P. D. Brown, Youngstown, Ohio; C. F. Harding, Lafayette, Ind.; Prof. H. S. Carhart, Ann Arbor, Mich.

QUESTIONS AND ANSWERS.

LONGEST TRANSMISSION LINES.

T. A. D., Dallas, Tex.: What is the longest power transmission line in this country or in the world?

Answer.

What is undoubtedly the longest transmission line in the world is that from De Sabla to Sausalito in Northern California. Its length is 232 miles. A number of other systems in California, such as that at the Kern River plants, are interconnected in such a way that in emergencies due to the shutting down of one plant or a tie line, an indirect line can be used of nearly as great length. The transmission line from Niagara Falls to Syracuse, N. Y., is 165 miles long and is next to the De Sabla line above referred to in length as a direct line.

CHANGE OF DYNAMO VOLTAGE.

H. S., Chicago: How can a 220-volt, direct-current dynamo be made to generate 110 volts?

Answer.

If a reduction of speed is possible by putting on a larger pulley on the dynamo shaft or reducing the speed of the prime mover, the desired result can be best attained. The exact amount that the speed will have to be reduced depends on the machine characteristics of the particular dynamo used and should be determined by experiment. In an ordinary self-excited shunt or compound dynamo a reduction of 20 to 30 per cent. in speed will reduce both the voltage and the field current so that the resultant electromotive force generated will be about one-half of the original.

If the dynamo is direct-connected to a prime mover of fixed speed, the field current will have to be reduced by cutting in considerable resistance. With a steady load and speed this may work fairly well. If either fluctuates rapidly, the voltage will be quite unsteady, because the machine will then operate at a point below stability on its magnetization characteristic.

CONSTANT-CURRENT TRANSFORMER.

F. W. S., Denver, Colo.: What is a constant-current transformer? How does it differ from an ordinary transformer? Is it the same as a current transformer?

Answer.

A constant-current transformer is one in which, as the load on the secondary varies, the current of the secondary remains constant, but its voltage changes in proportion to the load. In the ordinary transformer, which is a constant-potential transformer, the voltage of the secondary and of the primary remains practically constant, but the currents in these coils vary almost directly with the load on the secondary. This type of transformer has stationary coils, but in the constant-current transformer one of the coils, usually the secondary, moves relatively to the other and thus produces a varying magnetic flux and therefore varying voltage ratio between the coils.

What is ordinarily called a current transformer is not the same as a constant-current transformer. The former has two stationary coils, one of which is connected in series, with a line the current of which is to be determined; the other one is connected to the ammeter.

Constant-current transformers are used chiefly for alternating-current series arc-lighting circuits. These require a nearly constant current and a voltage varying directly as the number of lamps burning on the circuit.

LAMP INSPECTORS IN SESSION.

A meeting of all the lamp inspectors employed by the Electrical Testing Laboratories was held in New York on July 6th, 7th and 8th, inclusive. The following papers were presented and discussed: "Visual Inspections of Electric Lamps," C. E. Currier; "The Best Procedure in Lamp Inspection," C. H. Stephens; "The Selection of Life-test Samples," H. E. Allen; "The Effect of Varying Test Quantity upon Rejections," W. F. Ten Eyck; "'Bugs' in Photometry," E. L. Peck; "Lamp Inspections at Purchasing Companies' Storehouses," W. J. Bray; "The Criterion of Lamp Value," A. W. Minty; "The Value of Laboratory Tests," W. H. Rolinson; "The Functions of a Lamp Inspector," George H. St. John; "The Responsibilities of a Lamp Inspector," L. J. Lewinson.

B. J. ARNOLD TO APPRAISE NEW YORK TRACTION PROPERTIES.

Mr. Bion J. Arnold of Chicago has been appointed by the Public Service Commission of the First District of New York to supervise an appraisal of all the traction properties in the boroughs of Manhattan and The Bronx in New York city. The organization of an experienced corps of assistants to carry out this work is nearly perfected and actual work has been begun. At first the surface lines will be investigated and later the elevated and subway properties as well. Eventually the appraisal may be extended to Brooklyn.

BION J. ARNOLD.

In its endeavor to have the service on some of the Metropolitan Street Railway Company's lines improved, the commission was informed by that company that it was impossible to do so because expenses would be increased to such an extent that the fixed charges could not be met. "Upon receipt of this answer," said Mr. Arnold, when interviewed in his Chicago office, "the commission decided that it was but just to ascertain the aggregate value of the property upon which fixed charges should be based.

"The valuation will be made on the same general lines as the valuation made here. After getting an inventory, values will be placed upon each article and a determination made regarding the values of the franchises and other tangible properties. I presume the commission will use the valuation in an endeavor to establish better service, provided the valuation shows that the companies can be required to give such service without injustice to them."

Alluding to his appraisal of the Chicago traction properties, upon which the new settlement ordinances were based, Mr. Arnold modestly said: "I think it is pretty generally recognized that Chicago has blazed a way toward the correct solution of the traction question in large cities, and I suppose this fact was mainly instrumental in my being selected for the New York work."

Mr. Arnold has acted as consulting engineer for the New York commission on several investigations during the last year. In a report submitted a few months ago he advised the use of double side doors at each end of the Subway cars as a means for facilitating traffic. On the same day, June 29th, that he was selected to carry out the valuation of the New York properties, the Public Service Commission formally adopted his recommendation and ordered the Subway cars equipped with the additional doors.

TELEPHONE EARNINGS.

The American Telephone and Telegraph Company reports earnings for the first five months of 1908, in comparison with the same period of last year, as follows:

JANUARY 1ST TO MAY 31ST.

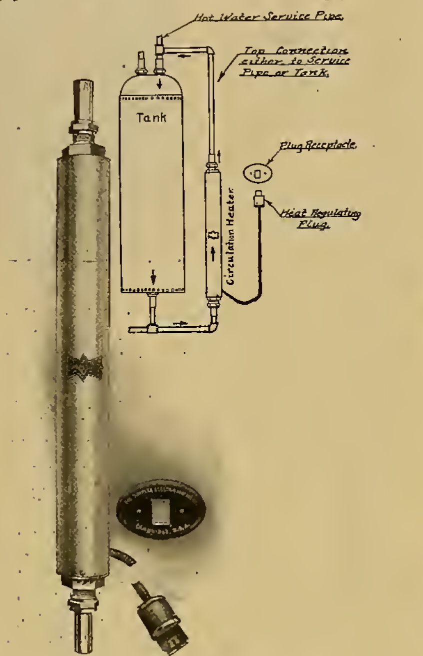
Earnings.	1908.	1907.	Increase.
Dividends received	$ 6,443,344	$ 5,685,090	$ 758,254
Interest, etc.	4,136,438	3,209,940	920,498
Telephone traffic	1,669,627	1,548,953	120,674
Real estate	42,580	24,728	17,852
Other	301,362	158,448	142,914
Gross	$12,593,351	$10,627,159	$1,966,192
Expenses	870,179	850,598	19,581
Net	$11,723,172	$ 9,776,561	$1,946,611
Interest paid	3,224,136	$ 2,860,447	363,689
Balance	$ 8,499,036	$ 6,916,114	$1,582,922
Dividend, April 15th..	3,050,560	2,631,028	419,532
Surplus	$ 5,448,476	$ 4,285,086	$1,163,390

The Co-operative Construction Company of Chicago asserts that it has completed arrangements whereby sufficient capital is guaranteed to construct and complete the remaining lines of street railway in Gary, Ind., known as the Gary and Interurban Railway. The power plant has been completed and the lines on Broadway have been put into operation. This additional capital is for the purpose of extensions on Fifth and Eleventh avenues to connect with East Chicago and Tolleston, Ind.

ELECTRIC HOT-WATER HEATER FOR THE HOUSEHOLD.

The introduction of electric cooking apparatus, especially for use in the summer months, has developed a demand for electric water heaters for the general supply of hot water about the dwelling. The Simplex Electric Heating Company of Cambridge, Mass., has recently put on the market a circulation heater for attachment to the range boilers, which seems to overcome many of the objections and difficulties of taking care of the hot-water problem electrically.

As shown in the diagram, the heater is placed beside the boiler, connected at the bottom through the pipe that also connects to the range, and at



ELECTRIC HOT-WATER HEATER.

the top with the pipe that supplies hot water to the house. This heater is so constructed that when the current is turned on it will in a few minutes begin to discharge water at about 180 degrees in the top of the boiler, drawing its supply from the bottom of the boiler, so that in a short time after the heater is turned on, there is but a small portion of the water in a large boiler heated.

The maximum current demand for this heater is two kilowatts, and when applied to the boiler in this manner it is said to make the boiler more efficient in the case of quick delivery of warm water than when the range is in operation. The current demand on the station is within reasonable limits, and for all practical purposes meets the average household demands.

The heater is arranged with three heat divisions, so that 500, 1,000 or 2,000 watts may be used as desired. Where considerable hot water is required the maximum heat may be turned on for a limited time, and then the temperature of the boiler kept up with the low heat. Where a large quantity is not desired, merely such as is needed about the kitchen for the ordinary requirements, a short period of the use of the maximum heat enables the supply to be provided at low cost.

The feature of construction of the heater which contributes to its efficiency in a large measure is the fact that the enamel, the heater and the tube are practically homogeneous, so that the heat is conducted directly to the water through the shortest possible path from the wires embedded in the enamel. This feature insures the quickest possible conduction of the heat generated to the water. Another feature of construction is the control of the circulation which insures the delivery of high-temperature water, thereby permitting hot water to be drawn in a short period after turning on the current, while utilizing all present house plumbing in the normal way and yet without having to heat up the entire contents of the boiler.

In practice, in the ordinary home, even at lighting rates, where care is used, the total cost for the use of this heater during such occasional intervals as it may be required in the summer time need never be large, or reach a point which would make its use prohibitive. The installation of the heater involves but a small job for the plumber and electrician, so that the total cost of the equipment is quite moderate. The device is three inches in diameter, 33 inches long, with three-quarter-inch couplings on either end. All of the outer portions are nckel-plated brass. For connecting to the circuit it is provided with a plug switch and flexible conductor.

"RADIUM" STORAGE BATTERY.

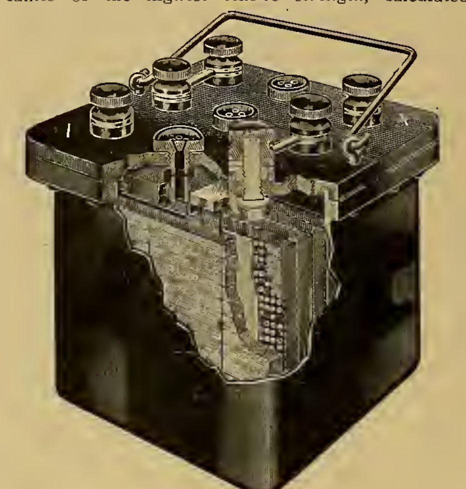
Illustrated herewith is a storage battery manufactured in Milwaukee, Wis., by the General Accumulator and Battery Company, that presents a number of interesting features.

The manufacturer of this battery has spent much time and money with the idea of producing a battery especially suited for hard and practical work in the line of automobile ignition and other arduous service.

The first and most important claim by the manufacturer of this accumulator is that it will not sulphate; and the company goes on record with the strong statement that it believes that no battery of any other make has as many square inches of surface pound for pound.

One important feature of the battery is the ease with which it can be opened for inspection and cleaned. The company believes it is just as necessary to clean and keep otherwise in good condition the various parts of a storage battery, as it is, similarly, to take care of any mechanical device.

The jars and covers are made of a hard vulcanite of the highest tensile strength, calculated



"RADIUM" STORAGE BATTERY.

to withstand the roughest usage. By the aid of a special device, a peculiar-shaped groove, the cover of the battery is sealed without the use of a rubber gasket. The sealing is supplemented by a thin layer of paraffin or wax applied to the groove.

The cover of the battery jar is fastened from below, so no metal parts are exposed, except the handle and the fastenings. As all fastening screws are on the outside of the sealing groove, no gas or acid can escape; hence the battery is always dry and clean.

The battery posts are sealed both below and on top of the cover, and this special sealing prevents any gases or electrolyte from creeping through.

The binding-posts are very substantial and the fastening nuts are made of acid-proof metal and are rubber-covered.

The battery grids are of a novel design, allowing a free expansion and contraction without injury to the compound; and the plates, it is asserted, will not buckle in the slightest degree. The grids are of chemically pure lead and are molded in one solid casting. The construction of the plates allows the maximum number to be placed in each cell, assuring the greatest fluid contact and long life.

One other important point relative to the plates is that no matter in what position the battery may be placed the construction is such that the fluid always covers the elements. A special kind of vent is provided on each cell, and this, with the company's "Radium" anti-splasher, prevents the escape of any fluid, although it allows a free escape of gas. These batteries are so carefully built that the manufacturer feels safe in saying that they are thoroughly waterproof; and that they can even be submerged in water and will continue to furnish current. This makes them useful for motor boats and gas engines running in damp places.

The manufacturer also asserts that the No. 66 Radium battery rated at "60 amperes" will, speaking roughly, furnish current for an ignition system running from 1,0000 to 1,500 miles, and that in many instances this size of battery has furnished, on one charge, from 2,000 to 2,500 car-miles of ignition current on four-cylinder engines.

Crossroad shelters along the interurban electric line from Milwaukee to Oconomowoc, Wis., are being built of steel and concrete in the bungalow style. They are open on all sides, so as to prevent their use as lounging places. Seats are provided that meet at the center dividing walls, thus always affording protection from the elements on at least one side.

FESSENDEN ON WIRELESS TELEPHONY.

Reginald A. Fessenden of Washington, D. C., presented a long paper on "Wireless Telephony" at the convention of the American Institute of Electrical Engineers at Atlantic City on June 29, 1908. The paper is divided into three parts. The first section deals with the development of wireless signaling. It is an attempt to give a complete and unbiased account of the history of this development.

It is pointed out that the use of Hertzian waves for wireless telegraphy was suggested by many scientists shortly after the publication of Hertz's results. Sir William Crookes' article in the Fortnightly Review for February, 1892 (p. 173), showed how fully that eminent physicist appreciated the possibilities of electric wave telegraphy. Following is an extract:

"Here is unfolded to us a new and astonishing world, one which it is hard to conceive should contain no possibilities of transmitting and receiving intelligence. Rays of light will not pierce through a wall, nor, as we know only too well, through a London fog. But the electrical vibrations of a yard or more in wave length, of which I have spoken, will easily pierce such mediums, which to them will be transparent. Here, then, is revealed the bewildering possibility of telegraphy without wires, posts, cables, or any of our present costly appliances."

The development proceeded along two distinct and diametrically opposed lines, i. e., the damped-wave, imperfect-contact system, which was developed in Europe by Lodge, Popoff, Jackson and Marconi, and the sustained-oscillation, perfect-contact system which was developed in America. Mr. Fessenden contends that the former system is essentially impracticable, and has gradually been superseded by the second type of system.

A brief résumé is given of the present state of the art.

The second section of the paper deals with the development of wireless telephony and with the methods and apparatus employed.

In the third section the author shows how the development of the commercial use of wireless telegraphy has been "strangled by government interference," so that at the present time it is impossible to obtain a permit to work stations for commercial purposes in practically any part of the world, and how this represents, in his view, a tax of many millions of dollars per annum on the general public. The question of government ownership and its effect on general development and progress is also touched upon.

A 12,000-BARREL CEMENT MILL ELECTRICALLY OPERATED.

The new mill of the Santa Cruz Portland Cement Company, at Davenport, Cal., with a normal daily capacity of 12,000 barrels of cement, is the largest mill on the Pacific Coast and one of the largest of those that have been built recently in this country. The quarry, the tipple and the railroad leading to the mill are all arranged to handle 10,000 tons of rock every 24 hours, as a considerable amount of rock from the quarry is marketed for general purposes.

The electrical power to operate the mill is purchased from the Bay Counties Power Company. The incoming 60,000-volt current is stepped down to 2,000 volts by three 1,100-kilowatt, oil-insulated and water-cooled transformers in a separate building with a concrete floor and concrete side walls. The 2,000-volt current is delivered to various parts of the mill on overhead circuits. A circuit-breaker and a starting box are provided on a board adjacent to each motor. The motors are all standard induction motors, which, being placed in separate tight rooms, where comparatively little dust reaches them, give practically no trouble in operation. Moreover, a motor of this type is so simple in construction that it needs no protection, except dust guards for the bearings. The wiring and automatic protection devices are also enclosed in such a manner as to eliminate danger of fire risk due to sparking.

Work was begun a short time ago on the track-laying and the overhead equipment of the Joplin and Pittsburg Railroad Company, an electric interurban line that is to connect Joplin, Mo., with Pittsburg, Kan., and other points in the latter state. The line is to be completed within 90 days.

CHICAGO-DENVER TELEPHONE CIRCUIT 1,430 MILES LONG.

The American Telephone and Telegraph Company has completed the installation of a long-distance line from Kansas City to Denver. This line comprises two circuits of No. 8 wire and runs almost straight west from Kansas City across Kansas to Pueblo, Colo., and then northward to Denver. It is the first line to cross the plains west of the Missouri River that is suitable for long-distance telephoning. An effective repeater has been installed at Garden City, Kan., about midway between the ends of the new line. This makes the transmission of speech possible without the use of Pupin loading coils, which are used extensively in long-distance work.

In connection with its news service at the Democratic national convention at Denver, the Chicago Daily Tribune leased the new line and connections from Chicago to Kansas City during the last week. On July 6th telephone communication between Chicago and Denver was successfully begun over these two circuits, which, with a length of 1,430 miles, makes this one of the longest telephone lines ever used. The mayors of the two cities, B. E. Sunny, president of the Chicago Telephone Company, and others talked over the new circuit. This is also the first time a newspaper has leased long-distance lines for telegraph or telephone service in the West. The newspaper service is carried over the line mostly by telegraph at night without interfering with commercial or press service by telephone at the same time.

CHICAGO THE ELECTRIC CITY.

Chicago is no longer simply the "Windy City" in popular estimate. Its other title, the "Electric City," has become well established by virtue of its being the country's electrical trade center, with flourishing electrical industries, electrical clubs and associations, and annually recurring electrical shows, which have set the pace for other aspiring towns, not even excepting New York.—From the Electrical Record of New York.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE.

Paris, June 24.—The new section of the Paris subway which runs from the Seine to the outskirts of the city is now in regular operation, having been opened for traffic not long since. It forms one-half of the subway line which is to run eventually across town from north to south, crossing the Seine, which lies at the middle point of the line. It will be some time, however, before the southern half of the line will be opened, owing to the work on the caissons under the Seine. This work will take a considerable time to finish. On the present half of the line which is now running, there are 11 stations, the last one being placed at the Clignancourt Gate. The subway runs past two of the principal railroad stations, the North and the East Depots. Near the Seine it connects with the No. 1, or east-west subway, and there is a common station at this point. Further on, it is cut across by the outer circular subway.

Work has been commenced upon the Seine at Paris for the new subway line which is to run in an east-west direction across town from the quarter of Auteuil to Place de Danube. The tunnel will be laid under the river by means of metallic caissons, which are to be sunk below the river bed, and it crosses the Seine at Place de la Concorde. It will cross the river a second time at the Mirabeau Bridge. The above-mentioned tunnel lies quite near the tube tunnel which I already described in connection with the north-south line. This latter is operated by an independent company and lies outside the regular Metropolitan system. The tunnel has now been carried under the Seine on the compressed-air shield method.

Among the new Swiss projects I note the construction of a narrow-gauge electric railroad which is to run from Monthey to Morgins, passing by Champéry. The time which is allowed for the concession of the narrow-gauge line which runs from Meiringen to Gletsch has been extended by two years, which brings it to the first part of 1911.

There is also a project for a new tunnel through the Alps which has a considerable interest, and it will be used for an electric-railroad line which is to be built in the eastern part of Switzerland. The proposed tunnel will be the most easterly of the Swiss series, and is to be known as the Septimer tunnel. The electric road, according to the present design, is to follow the Oberhalbstein Valley for most of its course before entering the tunnel. The entrance of the latter will be near the town of Trinzen, which has about 4,000 feet altitude above sea level. At the south end of the tunnel, the road passes between Rotticio and Vicosoprano. The whole of the line lies upon Swiss territory. It is expected to be of great value from a commercial standpoint.

Work is being actively carried on with the new hydro-electric plant upon the Gotha River, Sweden, which will be one of the largest on the Continent, giving 50,000 horsepower at present. There will be installed five turbo-alternators of 10,000 horsepower each. However, the total capacity of this stream is about 200,000 horsepower, and it is expected to utilize the remainder of it at a future period.

In Russia the municipality of Marioupol is drawing up the plans for an electric-lighting system. There is to be erected a new plant for light and power at Fiume, in Austro-Hungary. In the same country there is a project for a standard-gauge electric railroad which is to run from Neumarkt to Weizenkirchen. A. DE C.

GREAT BRITAIN.

London, June 26.—As I intimated last week, a decision has now been given in connection with the London electric power proposals. The House of Lords committee has passed the scheme put forward by Mr. Parshall and his colleague, Mr. Hammond, for the incorporation of a power company which will install a 60,000-kilowatt generating station on the River Thames at Barking, and from it to supply the existing authorities in bulk and also railways, tramways, canals, etc., and to individual power users when the local distributor is not in a position to do so. Of course, it must be understood that this decision, in a way, is only a preliminary one, for the whole question has still to be discussed by the House of Commons, and it is not at all improbable that, as was the case with Mr. Merz's bill of 1905, a certain amount of obstruction will be introduced into the ordinary procedure by the opposition, with the object of killing the bill by the effluxion of time. So far as the bill of the existing companies is concerned, the proposal to form a joint committee to take over the control of electric supply in London has been negatived mainly for the reason that all the distributing authorities were not unanimous, and therefore smoothness of working would be almost an impossibility. Therefore, the companies will be allowed to "link up" their undertakings for the purpose of mutual assistance, which has hitherto been forbidden, and also have the power given them to supply energy inside their areas for use outside, i. e., for railways, and so on.

Pneumatically operated doors are to be abandoned on the Metropolitan District tunnel cars on account of the large number of complaints which have been received from passengers who have been caught in them.

The Griffiths-Bedell surface-contact system of tramways which the London County Council has laid down in the east end of London has at last been put into operation.

A scheme is under consideration for the Institution of Electrical Engineers to purchase a home of its own on the Victoria Embankment. Hitherto the meetings of the Institution have had to be held by the courtesy of the various societies in the rooms of the Institution of Civil Engineers and the Society of Arts, but a building fund has been steadily mounting up, and some valuable property elsewhere was bought a few years ago with the idea of building a meeting place. The offer, however, of a building already for occupation has given a new interest to this question of a home, and at a meeting next week the purchase of the property in question is to be proposed.

Already some 150 exhibitors have signified their intention of exhibiting at the Manchester electrical exhibition, the arrangements in connection with which are so far advanced that the executive officers are meeting a number of engineers and others on the site next week at a luncheon. One of the features of the show will be a demonstration of wireless telegraphy between Manchester and some place about 50 miles away. Another feature will be a number of oil and gas-driven generating sets provided by the Gas and Oil Engine Manufacturers' Association.

The Radio-telegraphic Convention comes into force on Wednesday, and it may be mentioned that Great Britain has notified her adherence, as well as all the colonies with the exception of Newfoundland and the Orange River Colony.

The firm of Messrs. Bruce, Peebles & Co., which went into voluntary liquidation a short time ago, somewhat to the general surprise, is being reconstructed by the formation of a new company with a capital of $1,250,000.

The Drapers' Company, one of the city livery companies, has granted the sum of $110,000 for the building and equipment of an electrical engineering laboratory at Oxford University.

The Kastner-Kellner Alkali Company, which has recently turned out all its steam generating plant in favor of gas, has now installed a 1,000-horsepower vertical eight-cylinder four-crank tandem vertical gas engine, which has been made by the British Westinghouse Company of Manchester. There are already four 750-horsepower similar engines in this firm's Runcorn works, and it is said by the makers that the 1,000-horsepower engine is the largest yet made and put into successful operation. G.

EASTERN CANADA.

Ottawa, July 4.—Following up a remarkable offer it made to the City Council of Hamilton, Ont., to supply the city with power for lighting and pumping, at a price to be fixed by the Council itself, the Cataract Power Company of Hamilton has made another somewhat surprising offer regarding private-house lighting. In addition to being subject to arbitration, it guarantees that, in any event, the rates shall be at least 10 per cent. below the general tariff rates for incandescent lighting supplied by the city of Toronto to private users under the hydro-electric contracts. This is the outcome of the proposal of the city of Hamilton to establish a municipal power plant for light, heat and power purposes.

The private-bills committee of the Dominion House of Commons has thrown out the bill to incorporate the Dominion Power Development Company. This is the bill which empowered a company of Toronto and Montreal capitalists to develop waterpowers anywhere in Ontario or Quebec. It was objected to as overriding the rights of the provinces and of the municipalities.

That the abandoned Beauharnois Canal, though not of much use for navigation since the completion of the larger Soulanges Canal, is at the same time a valuable concession for the development of waterpower for the manufacture of electricity, has been made evident to the members of the Montreal City Council, who recently inspected the locality in question, at the invitation of the Robert syndicate, that is seeking admission to the city for the distribution of its electrical energy. With a head of 50 feet at St. Timothee, where the power house is to be erected, the engineers state that the company can develop 6,000 horsepower, taking the canal as it now is. W.

NEW YORK.

New York City, July 4.—On last Sunday the first test of the new high-pressure water system was made along West Street, between Bank and Gansevoort streets. The results were fully up to expectations, as a stream of water was readily forced to the top of the 12-story Western Electric Building. Twenty-four hose lines recently purchased stood the high pressure without trouble. Water was pumped at pressures up to 300 pounds per square inch from the two new electrically driven pumping stations at Oliver and South streets and at West and Twelfth streets. Fire Chief Croker said this high-pressure service is an absolute safeguard against any extensive conflagration and predicted that the general extension of the high-pressure mains throughout the city would allow the old steam fire engines to be finally discarded. The system has cost about $4,000,000 to install.

A decision by Judge Lacombe of the United States Circuit Court directing the receivers of the Metropolitan Street and New York City Railways to cancel the leases of a number of cross-town lines is generally regarded as the beginning of the end of the transfer system from the north and south surface lines to those running east and west. Since a number of these old cross-town railway companies no longer own any equipment of their own, it may be necessary to reintroduce horse cars on them.

Plans have been prepared by D. H. Burnham & Co. of Chicago, architects, for a 62-story office building to be constructed by the Equitable Life Assurance Society. This wonderful structure, which will be the highest in the world, will be composed of a main building 34 stories high, surmounted by a square tower and cupola reaching to a height of 909 feet above street level. Above this will rise a flagstaff 150 feet high. The building will replace the present Equitable Life Building at Broadway and Nassau, Pine and Cedar streets. Thirty-eight passenger elevators and a number of freight elevators will be provided. The structure is to cost in the neighborhood of $10,000,000.

On June 30th the Public Service Commission ended its first year of existence. The expenses of the board have amounted to $863,372 for this fiscal year. These figures indicate that the commission will cost very little more than the old Rapid Transit Commission, although it not only took over the work of that body, but of several smaller boards as well. A fairly good summary of the year's work accomplished has been made by the New York Times. These results are stated to be:

No. 1.—The stopping of the offering to the public of watered stocks by street railroad, gas or electric corporations, and the sale of legitimate securities of such corporations to "insiders" or favored parties at less than the rates which they would command in the open market.

No. 2.—The stopping of the practice of charging political expenses to construction or other accounts, which will be made impossible by the commission's action in providing for the corporations a new system of accounting, to which all must conform. This system is approaching completion.

No. 3.—Three new Subway routes, one for Brooklyn and two for Manhattan and the Bronx, laid out, and the contracts for the Brooklyn road awarded. Important changes made in the Brooklyn Loop Subway and an improvement ordered at Ninety-sixth Street, which will increase the capacity of the present Subway 33 per cent.

No. 4.—Service in the Subway, on all the elevated lines, and on most of the surface car lines, said to be materially increased as the result of orders issued by the commission.

No. 5.—Travel on the street railroads in all parts of the Greater City said to be made safer by the thorough repair and overhauling of rolling stock made by order of the commission.

No. 6.—The regulation of passenger fares and the establishment of a new system of transfers on the surface lines aimed at through the commission's order for an appraisal of all the property of the street surface railroads in Manhattan and the Bronx.

No. 7.—Investigation of the Metropolitan Street Railroad combination and disclosure of methods of financial mismanagement which startled the country. Also investigation into the right or justice of the 10-cent fare to Coney Island.

No. 8.—An investigation of the rates and contracts of electric-light and power companies and a resumption of the furnishing breakdown service by the lighting companies to individuals and corporations having independent plants.

No. 9.—The testing of gas meters and the investigation of thousands of complaints as to alleged fast meters. W.

INDIANA.

Indianapolis, July 4.—Two traction lines were opened for regular traffic service in Indiana during the week. One is the extension between Princeton and Patoka on the Evansville, Princeton and Southern Indiana Traction Company's line, a distance of 14 miles, and the other is the Michigan City and South Bend division of the Chicago, Lake Shore and South Bend electric railway, between South Bend and Kensington, a distance of 37 miles. The power for the latter system is furnished by a large plant in Michigan City that cost the company nearly a million dollars. The general offices, shops, etc., are also located in Michigan City. H. U. Wallace is general manager of the new road.

According to report, the South Bend and Northern Indiana Railway Company has taken over the franchise and property of the Indianapolis, Logansport and South Bend Traction Company, and work will be commenced on the construction of the line in the near future. The former road is owned and controlled by the Murdock syndicate.

During a recent severe electrical storm in Indianapolis three street cars were struck by lightning and put out of commission. None of the passengers was seriously injured.

The Mt. Vernon Gas and Light Company of Mt. Vernon has been incorporated to construct and equip a plant to supply Mt. Vernon and other towns and cities with gas and electricity for light, heat and power purposes. The capital stock is $100,000. Fred H. Goodrich, John G. Wester and J. W. Turner are directors.

Blank books in which the interurban companies of Indiana are to make their first uniform annual reports to the Indiana Railroad Commission are being sent out by C. B. Riley, secretary of the commission, to the various roads. The law requires that the repots must be on file with the commission by October 1st under a penalty of $100 a day for overtime.

The Brookville-Oldenburg Telephone Company has filed articles of incorporation with the secretary of state. The capital stock is $20,000. The company proposes to operate telephone lines in Brookville and throughout Franklin County. The directors are I. D. Garrgues, Fred Stumpf and M. P. Hubbard.

The long-drawn-out strife between the Central Union and the Richmond Home Telephone companies of Richmond has at last been settled, the former to remain in the long-distance field and the latter to monopolize the local business in Richmond. This does not mean that the Independents are to abandon their long-distance service, simply turning over to the Central Union such long-distance business as it cannot handle. S. S.

ILLINOIS.

Peoria, July 4.—By a change in the local offices of the Illinois Traction Company, Cecil Huron, traffic agent of the company for the Springfield and Decatur divisions, has removed his office to Decatur. Mr. Huron will in the future have charge of the lines running into Decatur.

The Illinois Coal and Material Company, which is a branch of the Illinois Traction System, has been incorporated with a capital stock of $2,500. The stock is held equally between Arthur C. Black, Samuel K. Holland and Bert Stephens.

Three hundred men employed in building the bridge across the Mississippi for the Illinois Traction Company have been out of work for 15 days owing to the high water. The high water has caused the company practically no loss. One caisson was swept downstream several days ago, but was recovered and replaced uninjured. The contractors expect to have the bridge finished, ready for use, about December 1, 1909.

Charles L. Lancaster, an expert electrician in the employment of the Illinois Traction System, who was severely burned by coming in contact with the high-tension wires of the company, died as a result of his injuries, after lingering 26 hours. Manager Linn of the Bloomington interests of the company says that it is a mystery how the man came in contact with the wires, as he was one of the best and most capable men that the company had in its service. V. N.

NORTHWESTERN STATES.

Minneapolis, July 4.—An electric-light system will be installed at Laurel, Mont., by the Billings and Eastern Montana Power Company.

C. A. Johnson will install an electric-light plant at Fairfax, S. D., in connection with the Fairfax Milling Company.

The Mitchell Power Company will erect an electric power house and coal-gas plant at Mitchell, S. D., at a cost of about $50,000.

The lighting system at Baudette, Minn., was put out of commission recently by the wrecking of the dynamo.

James J. Hill has sold all his holdings in Great Falls, Mont., amounting to about $10,000,000, to a syndicate composed of John D. Ryan, managing director of the Amalgamated Copper Company, and John G. Maroney, president of the First National Bank, and others. It is the intention of the syndicate to develop the waterpower and probably build a generating plant.

Albia, Iowa, has raised the $35,000 necessary for the extension of the Albia-Hocking interurban to Hiteman, seven miles northwest of the city.

The Eastern Montana Power Company of Billings, Mont., has commenced work on the electric line connecting the plant formerly owned by the Billings Water Power Company and the Yegen plant. The company has in view the construction of a transmission line throughout Eastern Montana.

The Lehigh Heat, Light and Power Company of Lehigh, Iowa, has been organized, with Thomas Cunningham as president, F. G. Orris vice-president, A. D. Post secretary, and Hal C. Fuller, treasurer, for the purpose of furnishing Lehigh with electric light. The company will be incorporated later on, it is said.

The report of the special accountants who were appointed to inspect the books of the Northwestern Telephone Exchange Company of Minneapolis, to ascertain the effect of the proposed reduced rates as named in the Dwyer ordinance, is to the effect that the reduced rates would result in a loss to the company of $29,180.76 on the first year's business. This differs somewhat from the company's claim of a deficit of $69,000, because the latter included toll business, while the examiners figured only on the local-exchange business. The Council will ask further information.

The capital of the Mesaba Telephone Company of Duluth, Minn., has been increased from $100,000 to $300,000.

The Zenith Telephone Company of Duluth, Minn., asks the Council for permission to rescind section 14 of its franchise, which provides for free service with Superior. The company states that the underground work which the Council has recently ordered makes the matter of a toll charge to Superior very desirable.

The Mutual Telephone Company is placing its wires underground in the principal streets of Ames, Iowa. Some of the college lines will also be put underground.

The Marshall Telephone Company of Marshalltown, Iowa, has purchased a centrally located building and will expend $10,000 improving it and building an addition 40 by 51 feet.

E. H. Martin and others propose to expend about $300,000 in Marshalltown, Iowa, erecting an Independent telephone exchange and equipping it with automatic telephones and underground wires. R.

MEXICO.

Mexico City, Mexico, July 1.—The Mexico Electric Tramways, Ltd., which owns the electric street-railway system in this city, its Mexico holdings being valued at $10,000,000 gold, may be placed in the hands of a receiver. A petition has been filed in the chancery division of the High Court of Justice of England asking that the lease of the electric street-railway system in this city by the Mexico Tramways, Ltd., to the company be set aside and that a receiver be appointed for the property.

A. A. Dudley and H. E. Stone of Douglas, Ariz., have obtained an option from Mrs. Rosa Viosca of Guaymas, state of Sonora, to purchase the street-railway system in that city. The prospective purchasers have planned to expend a large sum in converting the system into electric transit and in building extensions of the lines to neighboring towns.

The syndicate of Chinese capitalists, headed by Foon Chuck and Dr. J. W. Lim of Torreon, is making good progress in the construction of a system of electric street railway in Torreon.

The new electric street-railway system of the Vera Cruz Tramways Company in the city of Vera Cruz was recently placed in operation. The system extends to all parts of the town. The owners are S. Pearson & Son, a British firm of contractors, who are doing a large amount of public-improvement work in Mexico for the government.

It is reported that S. W. Fordyce of St. Louis, Mo., and associates who purchased the Matamoros and Santa Cruz street railway, which connects the town of Matamoros with the ferry landing on the Rio Grande opposite Brownsville, Tex., have adopted plans for rebuilding the existing line and for extending it to various parts of Matamoros.

The demand for electrical machinery for mines and mills shows a steady increase in Mexico. One of the latest orders of this kind to be placed with an electrical supply house of this city came from the Compania Negociacion Minera de San Rafael y Anexas of Pachuca, state of Hidalgo. The order consists of 40 motors, a large number of transformers, motor panels, high-tension and low-tension switchboards, circuit-breakers and pumps.

The City Council of Matamoros, state of Tamaulipas, has granted a franchise to the Electric Light Company of Brownsville, Tex., to extend its lighting system to that town.

The Saltillo Electric Light and Power Company will have its new light and power plant at Saltillo, state of Coahuila, finished in a few weeks. The new plant will have cost about $200,000.

It is reported that David R. Francis of St. Louis, Mo., ex-governor of Missouri, and a number of other American capitalists have become interested with Manuel Cuesta Gallardo of Guadalajara in the erection of a large hydro-electric plant on the Santiago River and in supplying Guadalajara and a number of other towns of the state of Jalisco with light and power. It is also planned to build transmission lines to Lake Chapala and utilize the electric power in operating large pumps for irrigating 500,000 acres of land. The maximum prices fixed in the concession is three cents a kilowatt-hour for current furnished for power, and $1 monthly for each 16-candlepower lamp. The maximum rate on lights for public use is fixed at $7.50 per month, and it is provided that power furnished public institutions shall be charged for at a rate of 10 per cent. below the prevailing price.

The Inde Gold Mining Company of Inde, state of Durango, has obtained a concession from the federal government to install a hydro-electric plant on the Nazas River.

The Compania Minera Jesus Maria y Anexas will install a hydro-electric plant on the Sinaloa River near the town of San Ignacio, state of Sinaloa. The power will be used to operate the machinery of the mine and mill of the company.

Steps have been taken by Parry Gosset and associates to install a hydro-electric plant on the Piaxtla River in the state of Durango. The power will be used by mines and industries of that locality.

The federal government has granted Nemesio Ponce a concession for the installation of a hydro-electric plant on the Angulo River in the state of Michoacan.

S. Pearson & Son, the British firm of contractors who are operating the Tehuantepec National Railroad under a 51 years' lease from the Mexican government, have installed a large amount of electrical equipment to facilitate the operation of the various departments of the road and to handle the freight at the two deep-water terminals more promptly than under the old method. Electric cranes are in use both at Coatzacoalcos, the Atlantic terminus, and at Salina Cruz, the Pacific terminus of the road. At each of these terminals there are now in operation 18 three-ton cranes fitted with 20-horsepower motors, and 30 electric capstans, each fitted with 15-horsepower motors. A power plant of 1,200 horsepower is in operation at each terminal for the purpose of furnishing power and lights. The firm also has a 600-horsepower electric plant at Rincon Antonio, situated midway between the two ports. This plant is for the purpose of supplying the car and machine shops with power and lights. The firm also has installed a 600-horsepower electric plant at Minatitlan, Isthmus of Tehuantepec, where it is developing a large oil field. H.

PACIFIC SLOPE.

San Francisco, July 1.—After long delays the beginning of actual work on the converting of the Southern Pacific company's local steam lines in Oakland and Alameda into electric roads is in sight. No exact date has been set for the commencement of work, but a quantity of material and machinery for the power plant has been on hand for some time, and as soon as the franchises are in satisfactory shape there is every reason to believe that construction work will be pushed. Most of the heavy improvements on the Harriman system on the Coast have been held up since the financial stringency of last fall, but with the opening of the new fiscal year today it is thought that a more liberal policy will be put into effect. The company has just commenced relaying the rails on Encinal Avenue, in Alameda. Two steam-turbine generating units are to be installed in an oil-burning plant at Fruitvale, and most of the machinery is on the ground.

The Vallejo, Benicia and Napa electric railroad is to have its sub-station at Napa about doubled in capacity. An addition to the building has been made and the concrete foundation has been put in for a new Westinghouse 800-kilowatt motor-generator set. The road was the first on the Pacific Coast to be equipped with a single-phase system, and it is now operating very satisfactorily between Vallejo and St. Helena, in competition with the Southern Pacific steam road, which it parallels. The 6,600-volt current is stepped down by static transformers at the sub-station to 3,300 volts for use on the trolley wire. The catenary system of overhead construction is used with the pantagraph trolley. The hot sun in the Napa Valley distorts the rails more or less during the middle of the day, but not enough to cause accidents.

Articles of incorporation have been filed by the Clear Lake Telephone and Telegraph Company, which has just been organized at Napa, Cal. The corporation purposes to construct and operate new telephone lines in Napa, Sonoma, Mendocino and Lake counties. The company is capitalized at $50,000. L. J. Sherman and M. S. Sayre of Lake County are heavily interested in the enterprise.

Advices from Florence, Nev., say that John B. Morris of Erie, Pa., and Robert E. Archibald of San Francisco will let a contract at once for the construction of two large power plants. One is on Big Creek and another on Alder Creek, in the Florence mining district. A.

PERSONAL.

Mr. G. H. Whittingham, president of the Monitor Manufacturing Company of Baltimore, Md., visited Chicago last week. This company makes controlling apparatus for electric motors.

Mr. H. C. Gillie, formerly with the Mahoning and Shenango Railway and Light Company at Youngstown, Ohio, has been appointed superintendent of the power plant of the Cleveland Illuminating Company. His successor at Youngstown is Mr. J. H. Forbush of Sharon, Pa.

Mr. David W. Ross, managing director of the Hewitt Manufacturing Company, has resigned to accept the vice-presidency of the Interborough-Metropolitan Company of New York city. Mr. Ross was formerly purchasing agent of the Panama Canal and of the Illinois Central Railroad.

Mr. Adolph A. Thomas has recently become associated as an assistant in the office of Brown & Williams, patent lawyers, of Chicago. After completing the course in chemical engineering at Case School of Applied Science, Mr. Thomas graduated from the Law School of Georgetown University. For four years he was an assistant examiner in the electrical division of the United States Patent Office. Having had considerable experience in practice before the courts and the Patent Office, he will devote himself principally to interference cases and to the prosecution of patent applications involving chemical, electrochemical and alternating-current technique.

ELECTRIC LIGHTING.

Clinton, Iowa, contemplates establishing an electric-light plant.

Wetumka, Okla., has voted $25,000 in bonds to construct an electric-light and water plant.

The Alvarado (Colo.) Electric Company has been incorporated with a capital stock of $32,000.

J. Huntley and others are organizing a company to establish an electric-light plant at Vollmer, Idaho.

The city of Clinton, La., contemplates establishing an electric-light plant. The mayor may be addressed.

A. H. Campbell and others have been granted a franchise for an electric-light and power plant at Toppenish, Wash.

A petition asking for all-day service at the municipal electric-light plant of Oconomowoc, Wis., has been granted by the Common Council.

At Oklahoma City, Okla., the Crescent Gas and Electric Company has been incorporated with a capital stock of $25,000. A. A. Klein, F. B. Owen and others are interested.

The People's Light, Water and Power Company of Newport, Ark., has been incorporated with a capital stock of $25,000. The incorporators are F. R. Suits, George O. Beebe and Henry Baldruss.

At Durham, N. C., the Suburban Land and Power Company was incorporated with $40,000 capital stock by E. J. Parrish, J. M. Gregory, John Sprunt Hill and others to build an electric-light plant. Mr. Parrish is president.

At Abilene, Kan., the Union Electric Company has practically completed the installation of a crude-oil-burning outfit under the boilers at its Riverside plant. It is believed that this will increase the capacity of the boilers nearly 45 per cent. A cement storage tank holding 21,000 gallons of crude oil has been built.

The Batavia (N. Y.) Light and Power Company has gone out of business. Competition with the big companies of Niagara Falls was too much and the affairs of the corporation are being wound up. Nearly a quarter of a million dollars has been invested in this corporation and its predecessors, which it absorbed. It has never been a profitable concern, it is said.

The Bliss-Cook Oak Company, Blissville, Ark., has installed an electric-light plant with a capacity of 600 lights. The company has in and around its sawmill, yard, offices and town five arc lights and about 400 incandescent 16-candlepower lights. The boilers are fed by the blowpipe system, which collects shavings and sawdust from the flooring machines, and carries this refuse to the boiler room.

In connection with the Democratic national convention held in Denver this week, there was a fine special illumination of the business streets leading to the Auditorium, where the sessions were held. Besides the ornamental posts along the curb line, streamers of red, white and blue incandescent lights were strung at each street intersection. Aside from this, there were many attractive private illuminations by merchants along these and adjacent streets.

Rochester, N. Y., has added another good example of special lighting in the illumination of the tower of the far-famed "Powers Block" on Main Street. With its goldleaf-plated dome, the tower is outlined by 2,000 eight-candlepower lamps. Above this dome is a large globe illuminated by 700 four-candlepower lamps that are flashed so as to make it appear as if the globe revolves. The installation cost about $5,000. It contains 128 circuits and consumes 74 kilowatts. The lights are run from dusk till late every evening and have proved a popular attraction.

According to a decree of the Chancery Court of Adams County, the property and holdings of the Southern Light and Traction Company of Natchez, Miss., consisting of an electric street-railway plant and electric-light and gas plants, were sold to Lynn H. Dinkins, president of the company, who is also president of the Interstate Trust and Banking Company of New Orleans. There were several bidders, but the property was knocked down to Mr. Dinkins for $5,000 above all liabilities of the company. The property is on the municipal assessment rolls for $125,000, which is regarded as a 50 per cent. valuation. The company was adjudged a trust and ordered to be dissolved, a writ of ouster being issued to that end.

ELECTRIC RAILWAYS.

Through service between Peoria and Springfield, Ill., on the Illinois Traction System will be begun about July 15th. Unforeseen delays between Lincoln and Mackinaw have hampered the work somewhat, but this gap is being rapidly closed.

Mayor Busse has sent a message to the Chicago City Council favoring the unified operation of all transportation lines, both surface and elevated. He demands better service from the elevated-railway companies. He urges the local transportation committee to formulate measures to enforce to the letter all of the contract obligations of the elevated-railway companies.

A decree was entered by the Superior Court at New Haven, Conn., on July 3d by which the New York, New Haven and Hartford Railway Company is ordered to indorse a guarantee of payment of dividends on the preferred shares of the New England Investment and Security Company, which is the holder of certain trolley properties in Massachusetts which formerly were owned by the New Haven company. The decree is a step toward taking the questions at issue to the Supreme Court of Errors.

The New Orleans and Seashore Air Line Railway Company is completing its plants for an electric railway to run 50 miles from New Orleans to Grand Isle, La., on the Gulf. The road is to be practically straight and level so as to permit of high-speed service to the island, which is quite a bathing and pleasure resort. The officers of the company are Jas. W. Porch, president, John H. Menge, secretary, and J. W. Stephens, chief engineer. The offices are at 303 Cotton Exchange Building, New Orleans.

The General Electric Company, Schenectady, N. Y., has just issued a comprehensive bulletin (No. 4593) devoted to the subject of "Railway Converter Substations." The publication gives a general description of the various pieces of sub-station apparatus, including rotary converters, transformers, reactances, blowers, cables, switchboards, etc., and includes illustrations of converter stations operated by various well-known railway companies. It contains also plans and elevations showing different arrangements of sub-station apparatus.

Elevated-railway traffic in Chicago showed some improvement in June over the previous month and over June, 1907, on the South Side and the Northwestern roads. The Metropolitan and Oak Park still show a decrease. The daily averages are as follows: South Side Elevated Railroad, June, 1908, 125,876; May, 1908, 119,313; June, 1907, 115,686. Northwestern Elevated Railroad, June, 1908, 109,107; May, 1908, 105,001; June, 1907, 99,051. Metropolitan West Side Elevated Railway, June, 1908, 144,361; May, 1908, 145,117; June, 1907, 148,518. Chicago and Oak Park Railroad, June, 1908, 43,859; May, 1908, 44,313; June, 1907, 45,115.

A petition has been submitted to the United States Circuit Court at Chicago by the receivers of the Chicago and Milwaukee Electric Railroad to be permitted to default payment of interest on the $5,000,000 bond issue of the Illinois corporation. The liabilities of the company were stated as being $22,249,100.51 against current assets of $1,803,600.39. During four months of the receivership the net income of the line was given as $9,809.66, without deducting interest on bonds, while the latter charge alone was $251,333 interest accrued on bonds during the same period. It is thought likely that Judge Grosscup will grant the plea on this showing and that therefore an immediate foreclosure on the bondholders' mortgage is bound to result.

POWER TRANSMISSION.

The United States Geological Survey has recently completed arrangements for continuing the investigations of the water resources of the state of Maine that have been carried on for a number of years in co-operation with the Maine State Survey Commission. At a meeting held lately in Augusta plans for the work during the next year were adopted. Among other things a complete report on the waterpower and other water resources of the Penobscot River will be prepared.

At Denver incorporation papers have been filed for the Kansas-Colorado Transmission Company with an authorized capital of $3,500,000. Among the directors are A. B. Hulit and W. O. Bourne of Scott City, Kan., and ex-Governor Alva Adams, Pueblo, Colo. These are the same interests that recently organized the Kansas-Colorado Railway Company. The transmission company was organized to build and equip power houses and transmission lines to sub-stations in the various towns to be reached by the railway. The route for the latter is being surveyed between Pueblo and Canon City via Florence. C. W. Davis, electrical engineer for the company, is also trying to determine the most suitable site for the main power house in this neighborhood.

TELEPHONE.

The Bigheart (Okla.) Telephone Company has been incorporated with a capital stock of $2,000.

The Kathio Independent Telephone Company will construct a line from Vineland to Onamia, Minn.

The Orient Telephone Company has been organized at Orient, Iowa, with a capital stock of $10,000.

The Luzon Telephone Company of Clairemont, Tex., has been incorporated with a capital stock of $25,000.

The Bridges Telephone Company of Catoosa, Okla., has been incorporated with a capital stock of $2,500.

At Clara City, Minn., the Rheiderland Telephone Company has been incorporated with a capital stock of $10,000.

The Kilkenny-Cordova Telephone Company has been granted a franchise for a local exchange at Kilkenny, Minn.

The Home Telephone Company of Cairo, Ill., has certified to an increase of capital from $5,000 to $10,000 and has increased the number of directors from three to five.

The Creal Springs (Ill.) Mutual Telephone Company has been incorporated with a capital stock of $2,500. The incorporators are H. P. Frick, A. L. Howerton, John R. Rector.

It is said now that the time when the Illinois Tunnel Company should have 20,000 telephones in operation in Chicago expires July 15th instead of next February, as stated last week. The company has sought the City Council to extend this limit. Unless the council does so at its meeting of July 13th the telephone franchise may be forfeited if a strict interpretation is followed.

An Independent telephone company will seek an entrance into the city of Chatham, Ont. The franchise of the Bell company must be renewed this year. Cheap telephones are promised, a cut of $10 a telephone being offered. This would mean prices ranging from $8 to $16 a year. The new company also plans to have an underground system, should it be permitted to compete with the present Bell monopoly.

On June 30th the Chicago Telephone Company had in service 219,396 telephones, of which 171,194 were city and 48,202 were suburban lines. On the same date last year the number of telephones in use was 189,794; thus there was a gain of 29,602 telephones, or 15.6 per cent., during the year. The net increase during the month of June was 3,147 instruments. At the close of the month there were over 5,000 unfilled orders for telephones on the hooks.

The telephone system which the Canadian Pacific Railway has installed between Montreal and Farnham, Que., as a substitute for the telegraph, in dispatching trains, has been in operation now for several weeks, during which time no telegrams have been used at all on this busy section. The result has been satisfactory, and will probably lead to a great extension of the telephone system. It is found that the calling of stations is much faster by telephone.

To provide for the rapidly increasing number of subscribers connected with the "Main" exchange the Chicago Telephone Company has installed another exchange unit called "Franklin" at its head office at Washington and Franklin streets. The Main and Franklin switchboards are located in different sections of the same building, but are entirely distinct except for the connection through trunk lines as they would be if in different sections of the city. A large number of heavy subscribers with private exchanges were changed from the Main to the Franklin board without interruption of service. At the Central exchange in the Chicago Title and Trust Building a similar installation of a new unit called Randolph was found necessary nearly a year ago.

TELEGRAPH.

The report for 1907 shows that there were 86,912 miles of overhead and cable telegraph wires in operation in British India against 4,555 in 1857. The annual earnings of the cables between India and Europe since 1902-3 show a surplus each year of from $1,000,000 to $1,200,000.

Recent statements have been made that both the Western Union and the Postal telegraph companies are seeking to abolish the leased-wire service of brokers throughout the country, and word has gone forth that as soon as certain leases now in force expire, they will not be renewed. The assertion is made that many large brokerage interests having leased wires from the West to the East, have been taking business away from the telegraph companies by offering to carry it at greatly reduced rates. Some of the brokers are said even to have solicited outside commercial business at one-half the usual rate, and in this way the companies have lost thousands of dollars a month.

PUBLICATIONS.

That clever "miniature magazine of light literature," Lux, keeps up its cheerful advocacy of the "great white light," by which is meant the light from the Nernst lamp. The July issue is breezy and welcome.

The addresses delivered at the installation of William Freeman Myrick Goss, D. Eng., as dean of the College of Engineering of the University of Illinois on February 5, 1908, have been published in pamphlet form as a University of Illinois bulletin.

The Ward Leonard Electric Company, Bronxville, N. Y., has issued a new catalogue, No. H1a, covering battery-charging rheostats for electric automobiles for private-plant and garage duty; also rheostats to take care of the discharge of storage cells, and a complete line of charging rheostats for ignition cells and portable batteries.

The Central Electric Company, Chicago, is distributing a booklet entitled "A Few Suggestions on Methods of Constructing Telephone Drop Circuits," and also calling special attention to its Universal porcelain insulators for this purpose. A considerable number of illustrations are employed, showing the various methods of attaching the insulators to cross-arms, poles and walls.

Bristol's recording thermometers form the subject of an interesting and well-illustrated bulletin issued by the Bristol Company of Waterbury, Conn. This company is a specialist in recording instruments. The present bulletin is principally devoted to class II. recording thermometers, which depend on the expansion of a vapor of a liquid (usually alcohol) in a bulb exposed to the temperature to be recorded. These recording thermometers have a number of uses, as in kilns, in recording temperature of feed water for boilers, etc. Many electric manufacturing and operating companies use them.

Automatic starting is often necessary to the economical operation of induction motors. Devices for the automatic control of such motors are described in Bulletin No. 4590, just issued by the General Electric Company, Schenectady, N. Y. The automatic compensators described in this bulletin are designed for the remote or automatic operation of the General Electric form K induction motors, or other motors of the squirrel-cage type in sizes of five horsepower and larger. They consist of two main oil-immersed switches operated by solenoids, which are excited from one phase of the current supply. The entire device is mounted on a slate panel having pipe supports which hold it at a convenient height. The same publication describes an automatic-control equipment for use in connection with the General Electric form M three-phase induction motors, the principal use of which is in maintaining a predetermined air pressure, water pressure or water level, by automatically starting and stopping motor-driven pumps in the supply mains.

The Western Electric Company has prepared an elaborate bulletin and a number of leaflets describing intercommunicating telephone equipments manufactured by the company. The bulletin (No. 1102) gives a good idea of the details of both the key sets and jack sets in which these systems are built. Both types can be equipped with either wall or desk telephones. The key form is used chiefly in hotels, residences and public buildings where attractiveness and convenience are of prime importance. Jack form sets are extensively used in factories and stores where the switching apparatus is subjected to excessive rough handling and where low first cost is an important requirement. All these sets are equipped for battery signaling. While these systems are designed for local service, they can also be equipped for connection to a city exchange. Magneto signaling can also be arranged for. A large number of circuit diagrams are given for the different types of equipment. The separate leaflets bring out briefly and clearly the advantages of intercommunicating telephone systems for residences and business establishments.

SOCIETIES AND SCHOOLS.

Peter W. Collins, grand secretary of the International Brotherhood of Electrical Workers, has issued a call for a meeting of the association for July 15th to be held in the city of Springfield, Ill.

The Galesburg (Ill.) Commercial Club held a special meeting on June 22d, at which Glenn Marston of New York spoke on "Franchises and State Control." Mr. Marston said that he believed the granting of franchises should be in the hands of state commissions, and that cities should have no voice in the regulation of their public utilities.

The next annual convention of the Colorado Electric Light, Power and Railway Association will be held at Glenwood Springs, Colo., on September 16th, 17th and 18th. J. F. Dostol, 405 Seventeenth Street, Denver, Colo., is secretary.

The twenty-seventh annual reunion of the Old Time Telegraphers' Association and the Society of the United States Military Telegraph Corps will be held on September 16th, 17th and 18th, at Niagara Falls, N. Y., with headquarters at the Cataract-International Hotel.

MISCELLANEOUS.

The Sanitary District of Chicago is said to contemplate the building of a belt-line railway to connect present and prospective manufacturing and industrial points along the Drainage Canal between Joliet and Chicago. A request for a lease of land along the canal for a right-of-way from the Chicago, Joliet and Kansas City Railroad was made to the real-estate committee of the Sanitary board; Manager King of the real-estate department, however, is said to favor a belt-line road, as it would bring to Chicago more benefits than sub-leasing to individual lines.

A Stamford (Conn.) press dispatch of July 6th says that James Hayes, 23 years old, is making a wonderful fight for life in the Stamford hospital. "Shocked by 11,000 volts of electricity and burned from head to foot, he is yet alive, but the hospital surgeons say he cannot live. Hayes is a Westinghouse Electric Company employe. He went on the roof of an electric locomotive of the New Haven road in the Stamford yards to oil a pantagraph, supposing that the power was off. The power was on, and when he grabbed the feed wire with his right hand 11,000 volts shot through his body and set his clothing on fire. He was hurled 15 feet into the air, and every stitch of clothing was burned off him."

At the Structural Materials Laboratories of the United States Geological Survey in St. Louis, Mo., a series of important tests on the stength of plain concrete beams has just been completed. These tests form part of a comprehensive series of investigations undertaken by the government for the purpose of determining the strength of concrete and reinforced concrete. The results will be printed within the next few weeks in a bulletin of the United States Geological Survey. The work involved in these investigations consists of a study (1) of the constituent materials of concrete, (2) of its stength when molded into various structural shapes, and (3) of the methods by which its maximum strength may be developed through various forms of metallic reinforcement.

TRADE NEWS.

The American Conduit Company, East Chicago, Ind., has just closed a contract for 125,500 feet of bituminized fiber conduit for the Lincoln Park commissioners of Chicago, Ill.

The Elgin Electrical Manufacturing Company of Elgin, Ill., has been incorporated with a capital stock of $10,000 to manufacture and deal in electrical machinery and appliances. The incorporators are M. E. Hepburn, L. B. Hamlin and C. G. Heywood.

The Pelouze Electric Heater Company has been incorporated under the laws of Illinois, with authorized capital of $25,000, to manufacture and deal in electric-heating devices and other specialties The incorporators are I. S. Blumenthal, J. E. Dittus and Lillian Olsen.

Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until 3 p. m. on August 11th for the construction, including electric conduits and wiring, for the United States postoffice building at Bedford, Ind., in accordance with the drawings and specifications, copies of which may be had at the office of the custodian of the site, at Bedford, Ind., or at the office of the supervising architect.

Announcement is made that the Cutler-Hammer Manufacturing Company of Milwaukee, maker of electric controlling devices, has just completed arrangements whereby it will be represented on the Pacific Coast by Otis & Squires of 111 New Montgomery Street, San Francisco. A large stock of standard Cutler-Hammer controllers will be carried by Otis & Squires, enabling them to make prompt delivery of apparatus. Mr. A. W. Vinson, who has been connected for several years with the engineering department of the Cutler-Hammer company, has been transferred to the office of

Otis & Squires, where his services will be available to those confronted with problems of electric control which cannot be met by the use of standard apparatus.

Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until 3 p. m. on July 31st for the installation of an electric passenger elevator in the postoffice at Huntington, W. Va., in accordance with drawings and specification, copies of which may be obtained at the office of the supervising architect or at the office of Parker & Thomas, Boston, Mass.

A new non-metallic flexible conduit, called "Verus," will be placed on the market in a short time. It is made of narrow tubular sections of asbestos fiber, treated with moisture-proof insulating compounds, which do not impair its properties of standing a fire test of about 400° Centigrade. It has a tubing on the outside of these sections, the whole having a woven cover over all, which is treated to the regular insulating compounds approved by the National Board of Fire Underwriters, with the additional quality of containing ingredients which give it rather an elastic exterior and thus prevent the cracking of the insulation in the process of bending at various angles. These conduits are being manufactured by the Proteus Electric Manufacturing Company, Allegheny City, Pa., for which Arthur P. Pierson, 23 N. Juniper Street, Philadelphia, Pa., is the general sales agent. In addition to asbestos-lined conduit, the company also manufactures flexible conduits of a like nature, with rubber-tube-lined interior, with spiral fiber-lined interior and also with spiral fiber-lined insulated interior, inside of which is a woven, highly insulated layer in the form of a tube.

BUSINESS.

Mr. B. J. Klein, Chicago manager of the Bristol Company, successor to William H. Bristol, reports a gratifying increase of western business since he has taken charge of this office. Mr. Klein is a graduate mechanical engineer, who has recently been sent West as successor to former manager, Mr. H. P. Dennis, who resigned to enter another business and who is at the present time spending a vacation period in Europe. Mr. Klein is most active and energetic in pushing his company's specialties throughout the western territory, and he has already made many friends, especially among the Chicago electrical fraternity.

In announcing its advent as a national dealer in the second-hand machinery field, the F. Bissell Company of Toledo, Ohio, is issuing "The Little Book of Real Bargains," a booklet which contains a long list of new and used machinery covering the entire stock. This is the first of a series of bargain lists to be issued every month. While this department of the company's business has been in existence for a good many years, it was not until recently that the second-hand machinery business was entered into on a large scale. A good deal of the success of this department can be attributed to the fact that the company buys or trades as well as sells. Thus, if for any reason a customer wishes to discard equipment for new or larger machinery, the company can submit a satisfactory and attractive proposition. In the booklet considerable space is given also to the manufacturing, switchboard and repair departments. The company will be glad to place the name of anyone interested on its mailing list.

DATES AHEAD.

National Electrical Contractors' Association (annual meeting), Chicago, July 15th, 16th and 17th.

Michigan Electric Association (annual meeting), Grand Rapids, Mich., August 18th to 21st.

International Association of Municipal Electricians (annual convention), Detroit, Mich., August 19th, 20th, 21st.

Ohio Electric Light Association (annual convention), Hotel Victory, Put-in-Bay Island, August 25th, 26th and 27th.

Old Time Telegraphers' Association and Society of the United States Military Telegraph Corps (annual reunion), Cataract-International Hotel, September 16th to 18th.

Colorado Electric Light, Power and Railway Association (annual convention), Glenwood Springs, Colo., September 16th, 17th and 18th.

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

Chicago Electrical Show (fourth annual), Coliseum, January 11 to 23, 1909.

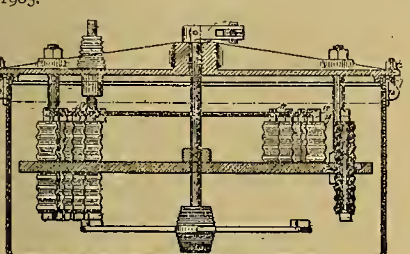
ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) June 30, 1908

891,825. Electric Wire Splicer. Conrad J. Dorff, Chicago, Ill. Application filed June 27, 1907.

A wire connector is formed of a strip of sheet metal two of whose opposite edges or sides are beveled and reversely bent to form parallel tubes adapted to receive the ends of the broken wire.

891,833. Oil Switch. Edward M. Gerry, Norwood, Ohio, assignor to the Bullock Electric Manufacturing Company. Application filed May 10, 1905.



No. 891,833.—OIL SWITCH.

A supporting plate has insulating supports mounted thereon, contact segments mounted upon the supports on one side of the plate and a movable member arranged to engage the segments successively. Resistance sections are mounted upon the supports on the other side of the plate and electrically connected to the segments, and there is a tank containing oil in which the contact segments are immersed. (See cut).

891,834. Controller-operating Means. Thomas Gilmore, Jr., Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed November 3, 1906.

An operating handle for a controller shaft comprises an arm fixed to the shaft and a second arm pivoted to the first and having a limited movement relative thereto, a notched member, a pawl carried by the handle, means for engaging the pawl with a notch which is covered by the handle, and means whereby a backward movement of the second arm alone disengages the pawl from the notch.

891,847. Dynamo-electric Machine. Emil Mattman, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed August 31, 1906.

The brush-holder construction consists of a number of brush-holders, strap cross-connectors connected thereto, a number of insulating spacing members between the latter and clamps extending around the cross-connectors for fastening them and the spacing members together.

891,860. Device for Securing Bond Wires to a Rail Joint. Welles M. Post, Wilkinsburg Borough, Pa. Application filed September 12, 1907.

A rail-bond support consists of a clip exteriorly supported upon the fish plate and means upon the clip for engagement with the rail bond.

891,887. Latch for Movable Lids. John E. Wallace, Woburn, Mass. Application filed May 23, 1907.

In combination with the casing of an electric-railway motor is a cover plate hinged at one end thereto and provided at its other end with a specially constructed latch.

891,893. Circuit-controlling Mechanism. George M. Willis, Chicago, Ill. Application filed August 29, 1906.

This contact mechanism for a window burglar-alarm comprises an upper and a lower member, the latter being provided with a chamber containing mercury, a contact rod forming part of the upper member and intended to enter the chamber upon relative movement of the members supporting the contact members, the rod having a number of turns to render it flexible.

891,898. Process of Making Low-carbon Metals or Alloys. Frederick M. Becket, Niagara Falls, N. Y., assignor to the Electro Metallurgical Company. Application filed August 24, 1905.

The process consists in producing under electric furnace conditions a metallic product low in carbon and high in silicon, and then oxidizing part or all of the silicon.

891,906. Armature Core. John F. Card, Three Rivers, Mich., assignor to the Sheffield Car Company, Three Rivers, Mich. Application filed March 16, 1907.

This core consists of a number of plates, having registered openings therethrough and provided with radial projections forming channels to receive the armature coils. Perforated rings are arranged between the plates and staple-like spacing members between the projections on the plates. (See cut on next page.)

891,924. Machine for Making Wire Glass. Japhus George, Wilcox, Pa., and Christopher M. Shortle, Bernhard's Bay, N. Y. Application filed May 29, 1906.

In combination with means for drawing glass are cutters carried thereby, fixed electric contact rails, fixed devices for moving the cutters through the glass, electric heaters carried by the glass-drawing means and brushes on the heaters to engage the contact rails.

891,947. Automatic Car Brake. James H. K. McCollum, Toronto, Ontario, Canada. Application filed November 17, 1906.

A spring-actuated brake having a pivoted lever introduced between and connected with the spring and the brake shoes is provided with an electromagnet having its armature linked to the lever and electrically connected to a supply of electric current and effecting an electrical pull on the lever greater than the mechanical pull of the spring.

891,948. Electric Fire Alarm and Thermo-indicator. Alfred H. McNeil, Higham's Park, England. Application filed November 11, 1907.

The fire-alarm apparatus comprises thermal strips of different sensitiveness to temperature changes, plungers connected with the strips and electrical contacts connected to move one in advance of the other in the paths of the plungers and of each other.

891,955. Insulator. William C. Sandlin, Andrews, N. C., assignor of one-third to Arthur Moulton and one-third to C. W. Savage. Application filed September 25, 1905. Renewed December 16, 1907.

The base of the insulator has a double dove-tailed grove fitting into a corresponding tongue on the cross-arm.

891,961. Telephone-controlling Device. Nathan Silverson, New York, N. Y. Application filed November 2, 1906.

The book-switch is provided with a gravitating member consisting of a plate free to swing in a plane at right angles to the movement of the switch lever, the plate having two depending arms, one of which normally holds the lever as against movement, while the other normally lies adjacent the armature of the signal electromagnet.

891,982. Electrolytic Process for the Production of Metallic Dark Coatings Upon Metals. Alexander Classen, Aachen, Germany. Application filed September 3, 1907.

After the deposit having the bright metallic luster has been produced, the tension of the current is considerably reduced.

891,995. Electrolytic Cell. Ralph B. Ingram, Wilkinsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company. Application filed October 24, 1906.

This cell comprises a number of similar fluid-containing trays, each having a central frusto-conical indentation, and means for supporting each plate at a point above the maximum liquid level in the plate below. (See cut on next page.)

892,016. Trolley Wheel. Robert P. Stark and Chas. R. Klingensmith, Creighton, Pa. Application filed April 23, 1907.

The wheel is in four parts, a central bushing, a grooved body part and two side plates bolted thereto.

892,035. Electrical Automatic Stop for Gasoline Engines. Charles Echard and Rolla S. Paul, Montgomery City, Mo. Application filed August 9, 1906.

This apparatus consists of a rotatable cylinder, means for automatically rotating it in one direction, electrically controlled means for holding it against such rotation and for releasing the holding means, and a finger carried by the cylinder.

892,037. Sparking Igniter for Explosive-gas Engines. Frederick A. Feldkamp, Newark, N. J., assignor of one-half to Henry Berg, Orange Valley, N. J. Application filed June 25, 1907.

A make-and-break appliance for a spark-producing system comprises a movable electrode, pairs of pole-pieces, and a magnetic core secured between the outer end-portions of each pair of pole-pieces, and electro-magnetic coils mounted upon the cores.

892,038. System for the Ignition of the Gaseous Mixtures in Explosive-gas Engines. Frederick A. Feldkamp, Newark, N. J., assignor of one-half to Henry Berg, Orange Valley, N. J. Application filed August 24, 1907.

In this ignition device an incandescent body is included in the ignition circuit.

892,056. Excavating Machine and the Like. George W. Jackson, Chicago, Ill. Application filed April 3, 1908.

A horizontally and vertically swinging arm is mounted on a frame and an operating device is carried by the free end of the arm. A motor is carried by the arm and connected through a flexible shaft with the operating device.

892,060. Disconnecting Device for Telephone Lines. Frederick Johnson and Harry Smith, Hatfield, Mo. Application filed March 27, 1907.

A contact lever is pivotally connected to a post by an insulator, and provided with an enlarged bead having a depression to engage a line wire. There is a spring for holding the lever in contact with the wire, a house wire connected to the lever and a cord for operating the lever against the tension of the spring.

892,065. Electromagnet. David L. Lindquist, Yonkers, N. Y. Application filed June 14, 1905.

A source of alternating current energizes an electromagnet provided with an armature and a resilient abutment for the armature constructed to absorb the vibrations thereof due to current alternations in the coil.

892,068. Writing Machine. Fred F. Main, Columbus, Ohio. Application filed July 1, 1907.

Connected with a line-spacing lever is a piston moving in a cylinder. The valve for the latter has oppositely disposed arms, each connected to a spring-mounted core energized by a solenoid.

892,087. Reflector for Searchlights. Jean A. Rey, Paris, France. Application filed December 15, 1905.

In combination with an electric arc lamp is a parabolic reflector having its reflecting surface of gold.

892,088. Marine Fire-indicating System and Extinguisher. William Rich, New York, N. Y. Application filed September 26, 1907.

This system comprises a station box, a number of pipes leading therefrom to the holds or bunkers of a ship, a fan mounted within the box above the pipes, an electric motor to operate the fan, and a wheel mounted on a clock works, and provided with posts adapted to contact with brushes to open and close the circuit periodically.

892,095. Electric-light Cut-off. James B. Smith and Yancy D. Lott, Jackson, Miss. Application filed December 18, 1906. Renewed March 4, 1908.

A snap switch has an arm secured to its handle. A winding drum upon the alarm-clock spring-winding shaft has flexible connection between it and the arm, and an elastic power-storing element interposed in this connection.

892,158. Relay for Burglar-alarm Systems. Ole Jacobson, Chicago, Ill., assignor to the Bankers' Alarm-Protection Company, Chicago, Ill. Application filed November 8, 1907.

A relay for a closed-circuit burglar-alarm system has an electromagnet in the main circuit, an armature normally attracted to this magnet, and another electromagnet equal in strength with the first-mentioned electromagnet to co-operate with the spring in holding the armature against a contact by the main circuit when the interference in the main circuit is removed.

892,167. Mounting for Electrical Apparatus. Malcolm E. Launbranch, Chicago, Ill., assignor to the Western Electric Company, Chicago, Ill. Application filed December 7, 1904.

Electrical mechanism is mounted upon a removable shelf in a containing case in such a way that the shelf may be drawn out and tilted to permit ready access to the apparatus mounted thereon, without being disengaged from its guideways.

892,177. Electric Illuminator. Henry J. Mullen, Burlington, Vt. Application filed September 22, 1905.

The device comprises a cylinder rotatably and removably supported within a frame, and having a covering of insulation, metal contact wires wound upon the insulation and electrically connected to the metal rings concentrically arranged upon the solid end of the cylinder, and spring contact fingers carried by the frame and engaging the cylinder.

892,188. Process for Separating and Simultaneously Extracting Water from Mineral, Vegetable and Animal Substances. Botho Schwerin, Frankfort-on-the-Main, Germany, assignor to Farbwerke vorm. Meister Lucius & Brüning, Höchst-on-the-Main, Germany. Application filed April 30, 1907.

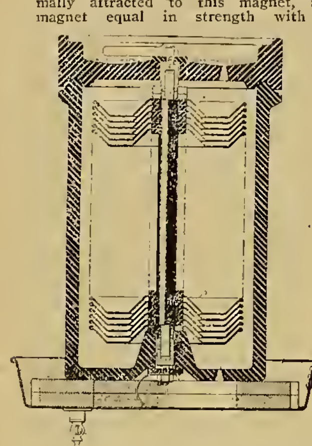
In an electrolytic process for separating and simultaneously extracting water from non-conducting vegetable, animal and mineral substances by means of electro-osmosis, there are means for causing the suspended solid particles to deposit fractionally on non-conducting pervious diaphragms placed before the electrode.

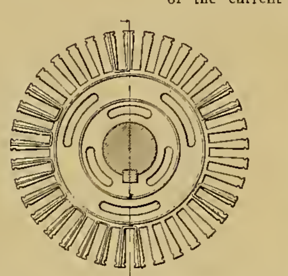
892,203. Signaling System for Railroads. Max W. Zabel, Chicago, Ill. Application filed April 13, 1907.

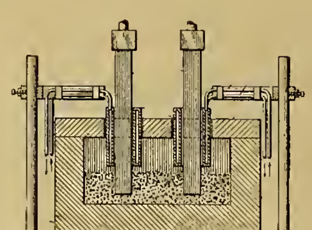
The system comprises a signal-sending station, a number of signals distributed along the right-of-way, electromagnetic means associated with each signal for operating it, circuit-changing devices in connection with apparatus for supplying currents of different electrical character at the sending station for causing the operation of any desired electromagnetic means to the exclusion of the remaining means to operate the signals, and electromagnetic means for receiving a return indication from the operating signals.

892,204. Railway Signaling Apparatus. Max W. Zabel, Chicago, Ill. Application filed April 13, 1907.

This is a modification of the preceding patent.







No. 891,995.—ELECTROLYTIC CELL. No. 891,906.—ARMATURE CORE. No. 892,211.—ELECTRIC FURNACE.

892,211. Process of Producing Low-carbon Alloys. Frederick M. Becket, Niagara Falls, N. Y., assignor to the Electro Metallurgical Company. Application filed January 8, 1908.

The process of producing ferro. alloys having a low carbon content consists in smelting a charge containing an ore of a refractory metal and a reducing agent between electrodes of iron, cooling the electrodes, and regulating the consumption of the electrodes and the composition of the product by controlling the cooling effect at the working ends of the electrodes. (See cut.)

892,212. Electric-furnace Method. Frederick M. Becket, Niagara Falls, N. Y., assignor to the Electro Metallurgical Company. Application filed January 8, 1908.

This continuous electric-furnace-smelting method consists in passing an electric current through a molten bath while maintaining at the surface thereof a heat-retaining crust of the solidified constituents of the bath, and providing apertures in the crust for supplying the charge and permitting the escape of volatile reaction products.

892,220. Junction Box for Electrical Conductors. James F. Burns, Philadelphia, Pa. Application filed September 28, 1907.

The box has integral walls at right angles to each other and provided with recesses in opposed parallel edges, a removable and reversible plate, coextensive with the space between the walls and provided with projections and recesses at its opposite edges arranged to register with those in the walls, in different positions.

892,235. Illuminated Showcase. Leonard Erikson, Malden, Mass. Application filed July 27, 1907.

A glass-front showcase has an overhanging ledge in which is mounted a reflector and an incandescent lamp.

892,241. Method of Electrically Detecting Dangerous Gases and Apparatus Therefor. Heinrich Freise, Bochum, Germany. Application filed June 10, 1907.

The method consists in passing the dangerous gas across rays of light projected from a source of light to a selenium cell inserted in a primary circuit, thus darkening the selenium cell and reducing the strength of the current in this circuit, whereby electromagnetic devices are caused to close a secondary circuit for actuating warning devices.

892,249. Electrical Vibrator. Maximilian K. Golden, San Francisco, Cal. Application filed February 19, 1908.

The apparatus consists of a vibratory arm fixed at one end, a magnet carried by the arm, a stationary armature for the magnet, a second and stationary magnet, and an armature therefor carried by the arm, the magnets coacting when energized.

892,253. Igniting Mechanism for Explosive Engines. George B. Hakins, Norwood, N. Y. Application filed February 5, 1906.

This mechanism has means for advancing or retarding the firing of the gases relative to the position of the piston. There is also a switch for cutting the igniter entirely in or out of action.

892,270. Device for Automatically Stopping Trains. George W. Lancaster, Richmond, Va. Application filed February 25, 1907.

A mechanism designed to operate the trips of an air-brake system is operated by an electromagnet when the semaphore is set at danger.

892,271. Electrical Device for Automatically Stopping Trains. George W. Lancaster, Richmond, Va. Application filed February 25, 1907.

This is a modification of the above. Auxiliary contact rails are provided for completing the circuit.

892,272. Trolley Guard and Guide. Charles Latsch, Cleveland, Ohio, assignor of 24 one-hundredths to C. A. Mueller and 24 one-hundredths to Jos. H. Wenneman, Cleveland, Ohio. Application filed September 3, 1907.

A trolley support carries trolley wheel therein and is provided with hinged side guards having rollers in their upper ends over the wheel and bearing balls freely mounted in the top and center of the rollers and extending above the same.

892,279. Drop Trolley. Thomas H. Mars, Chicago, Ill. Application filed October 5, 1906.

The trolley pole is mounted so that it can oscillate on a turret member at its base, to which it is connected by a toggle mechanism.

892,285. Sparking Plug. Emile Moonen and Albert Dumaire, Paris, France. Application filed December 7, 1906.

This spark plug for explosion motors has a body provided with a slotted tubular extension forming one of the poles and a central rod having a head and forming the other pole.

892,311. Apparatus for Plotting Resonance Curves. Otto Scheller, Steglitz, near Berlin, Germany. Application filed March 9, 1908.

The instrument consists of a variable self-induction element, including a movable coil, a variable condenser provided with movable plates and means connecting the two parts so as to cause the adjustment of one to adjust the other accordingly.

892,312. System for Receiving Undamped Electric Oscillations. Otto Scheller, Steglitz, near Berlin, Germany. Application filed March 9, 1908.

A receiving system for wireless telegraphy comprises a resonant receiving circuit, a resonant indicator or detector circuit associated therewith, and connections between the circuits, including an interrupter and a rectifier.

892,319. Binding Post. Nicholas Sohl, New York, N. Y., assignor to W. R. Ostrander & Co. Application filed May 28, 1907.

A base-plate having oppositely disposed ears is provided with apertures having curved bearing edges provided with notches, and a spring-actuated arm between the ears and provided with offset edges adapted to conduct a wire automatically into the notched portions of the ears and hold the wire therein.

892,322. Coin Collector. Edwin H. Smythe, Chicago, Ill., assignor to the Western Electric Company, Chicago, Ill. Application filed October 20, 1905.

A coin collector for telephone lines has a coin chute with a refund passage, an electromagnet, for diverting coins near the entrance of the chute into the refund passage, a stop also actuated by the electromagnet and adapted to arrest a coin in the chute beyond the mouth of the refund passage.

892,332. Electrical Incandescent Lamp. Orlando M. Thowless, Newark, N. J. Application filed October 26, 1906.

A filament for incandescent lamps consists of a tube of substantially pure tantalum filled throughout its interior with a compact core of refractory non-conductive metallic oxide.

892,355. Trolley Wheel. George C. Bourdereaux, Peoria, Ill., assignor to Melvin W. Swartz, Peoria, Ill. Application filed August 29, 1906.

A fork for a trolley wheel has an arm at each side of the wheel, constituting a bearing for the shaft, and a thrust plate carried in each arm for receiving the end thrust of the shaft, which is adapted at its ends to bear only at its axial center against the plates.

892,359. Electric-railway Signaling System. Yorke Burgess, Washington, D. C., assignor to the American Signal Company, Kansas City, Mo. Application filed September 24, 1907.

Combined with a source of energy, a signaling means and a pair of traveling contacts on each train is a pair of continuous conductors crossing each other at intervals throughout the length of the system, so that each contact will engage the conductors in alternating order.

892,360. Electric Insole. William H. Burns, Naperville, Ill. Application filed July 11, 1907.

This insole comprises a pair of superposed metallic plates, each of which has alternating bars and spaces, the bars of one plate being in alignment with the spaces of the other, so that the foot of the wearer contacts upon the bars of the upper plate and protrudes through the spaces therein into contact with the bars of the lower plate.

892,371. Trolley Ear. Charles W. Eliot, Tampa, Fla., assignor of one-half to William H. Caldwell, Tampa, Fla. Application filed April 9, 1906.

The trolley ear has an integral boss with a threaded socket into which is screwed a shank. A pin keeps the two parts from turning.

892,375. Electric Socket Switch. Harvey Hubbell, Bridgeport, Conn., assignor to Harvey Hubbell, Incorporated, Bridgeport, Conn. Application filed June 7, 1907.

A socket switch consists of a contact bar having sockets containing rollers, a contact plate provided with alternate projections and depressions, a shaft loosely engaging the contact bar and means for retaining the rollers closely in engagement with the projections and depressions.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired July 7, 1908:

455,316. Annunciator. M. Garl, Canton, Ohio.
455,320. Telegraph Key. R. W. Green, St. Thomas, Canada.
455,340, 455,341 and 455,342. Electric Railway. W. H. Knight, New York, N. Y.
455,343. Electric-railway Plow. W. H. Knight, New York, N. Y.
455,352. Electrical Watchman's Clock. H. S. Park, Chicago, Ill.
455,398. Quadruplex Telegraphy. X. D. Haskins, Brooklyn, N. Y.
455,447. Conduit for Electric Railways. W. Bradley, Fort Wayne, Ind.
455,454. Electric Railway. E. W. Rice, Jr., Lynn, Mass.
455,510. Train-signaling Apparatus. L. F. Jordon, Somerville, Mass.
455,524. Electric Meter. J. J. Wood, Brooklyn, N. Y.
455,575. Electric Meter. J. T. Olan, New York, N. Y.
455,576. Electric Arc Lamp. J. T. Olan, New York, N. Y.
455,693. Galvanic Battery. H. C. Sample, Ravenswood, Ill.
455,696. Switchboard for Electric Fence Stations. D. H. Wilson, Normal, Ill.
455,711. Electric Motor. L. G. Goode, Jersey City, N. J.
455,726. Electric Motor or Generator. W. F. Brown, St. Paul, Minn.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, JULY 18, 1908 No. 3

A DIFFICULT PIECE OF SUBWAY CONSTRUCTION IN PARIS

By A. de Courcy

The construction of the new subway line which crosses Paris from north to south for the Metropolitan electric railway has been a specially difficult piece of work. This is due to the fact that the line is taken across the Seine, and as it was decided not to erect a bridge at this point the underground tunnel had to be continued under the river bed. Metallic caissons were employed for this purpose, as this method was found preferable to the shield system of tunnel building. The present enterprise, as far as it relates to the metallic caisson work, is now being carried out by one of the leading Paris firms, the L. Chagniaud company.

Up to the present time there has been no rapid transit system between the northern and southern parts of the city, and this is especially felt by the inhabitants of the southern district, who are obliged to reach the center and the northern districts, or the business part of town, by means of various lines of omnibuses, some of which are quite antiquated. The use of the new automobile omnibus which is now substituted for the horse vehicles on some of the lines is an improvement, but there is no doubt that the new subway line will carry a large traffic and it will be one of the best patronized lines of the Metropolitan system.

Heretofore there has been no difficulty in taking the Metropolitan lines across the Seine, for the reason that bridges are used for such lines. The south circular line crosses the Seine on a special bridge which was built for the purpose at Passy, this being a stone arch bridge which serves for the wagon road and sidewalks, with an upper iron structure supported on iron columns, the latter being used for the Metropolitan tracks. In another part of the city the lines cross the Seine upon iron bridges.

As these bridges lie in the eastern and western parts of town and away from the center there was no objection to erecting them, but as the present line crosses the Seine quite in the central district, it was not considered wise to add to the already great number of bridges in this vicinity. Moreover, a new bridge would take away much of the picturesque character of this part of town, which it is desired to preserve. Accordingly, it was decided to run the line under the river bed in a tunnel. This was a difficult undertaking, and the prefecture of the Seine had a number of competitive projects laid before it by the leading constructors.

When the matter first came up there was some idea of the use of a double tunnel, both tubes to be run under the river by the compressed-air shield method. However, the Chagniaud company presented a project for a single tunnel for the two tracks, to be built by the use of metallic caissons sunk directly in the river bed, this tunnel to have about the same section as the standard tunnel at the shore ends. As there are many advantages connected with such a system the Chagniaud project was finally adopted. The cost of the tunnel and the two underground stations on its path is figured at $3,200,000, and the total length of the iron construction is 0.70 mile.

One advantage of the use of metallic caissons lies in the fact that the work can be carried out at a less depth below the river bed than would be required for a tunnel operated on the compressed-air shield system. This brings the resulting tunnel to a higher level, and the grades which are needed for joining it on to the standard tunnel are therefore less. At the same time the underground stations in this part of the line are placed nearer the surface, which is a point to be considered, especially where passengers are obliged to climb the staircases. This is one of the disadvantages of a subway which it is desired to diminish as much as possible.

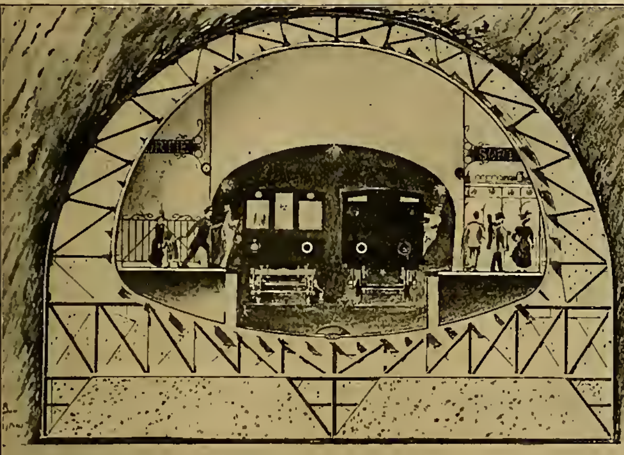
The subway line starts in the standard tunnel at the Clignancourt gate, in the northern part of town, and proceeds across the city in a southerly direction, crossing the north circular subway at the Barbes station. One of the succeeding stations lies at the north depot, and not far from this is an important station placed at the east depot, where three lines are to cross eventually, and there is an elaborate piece of tunnel work. From this point the line continues southward past the Central Market station as far as the Seine. Here the tunnel crosses underneath the No. 1 or east-west subway line, and there is a double station known as the Chatelet. Upon reaching the Seine the tunnel connects with the metallic tunnel which passes under the river, crossing the large arm of the Seine to the City Island. There is a large underground station on the island which is also built of metallic caissons. Crossing the small arm of the Seine, the line reaches a second and larger underground station, built also of ironwork, and thence the metallic tunnel is continued on the south bank until dry ground is reached, when it joins on to the standard masonry tunnel. The latter then continues under the Rue de Rennes and the Boulevard Raspail, crossing the south circular line, and finally ends at the Orleans gate, which forms the southern terminus.

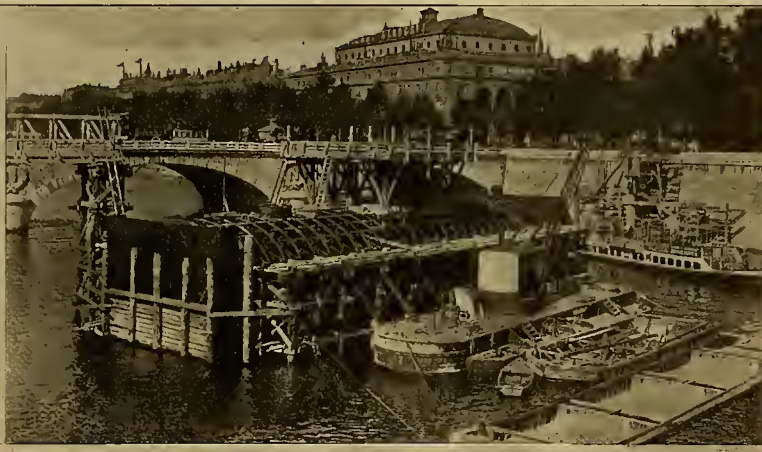
The following points as to the caisson work on the line have been furnished the writer by Mr. Chagniaud. This construction includes several different parts: First, the caisson tunnel under the large arm of the Seine; then the station, which is located under the island; also the caissons which are sunk under the small arm of the Seine, and finally the large underground station placed under the Place St. Michel, on the left bank.

The caissons which are sunk in the river were built at another point on the river bank and were towed along the river to the required point, where they were lowered to the river bottom. On the other hand, the great caissons for the stations were first built in a cutting at some distance below the ground level, and when completed they were then lowered to the level of the tunnel by means of the compressed-air system.

Considering the metallic caissons which are sunk in the Seine, their general appearance is shown by the accompanying illustrations. In the large arm of the Seine there are three such caissons to form the tunnel, while there are two sections in the small arm of the river. The inner or main part of the caisson consists of an iron tunnel having the general elliptical section of the standard tunnel. It is built up of a succession of iron rings which are bolted together, these rings being two feet in width.

Each of the rings is made up of a certain number of cast-iron voissoirs which have the proper curvature. When bolted together such voissoirs make a complete ring having the tunnel section. The whole construction forms a cast-iron tube or tunnel, around which is built a skeleton iron frame so as to afford a support for the outer iron plating. The sides of the caisson are made straight in this way, and when the sheet-iron plating is put on the sides and ends the whole has the appearance of a huge box. For the large arm of the Seine three such caissons were successively towed from the

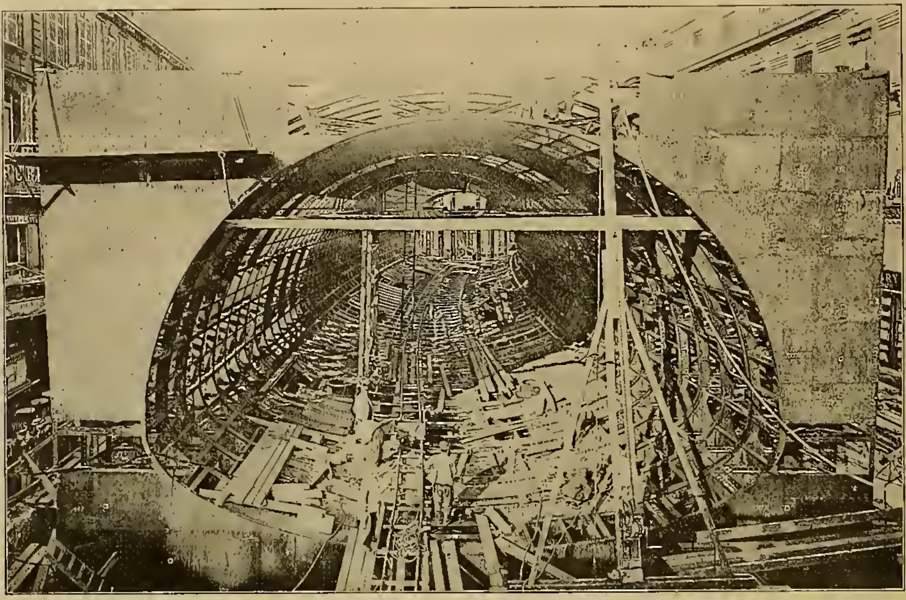




Cross-section of the Middle Caisson at Station. A Caisson in the Seine.
Profile of Metropolitan Electric-railway Tunnel Under the Seine and City Island.
A DIFFICULT PIECE OF SUBWAY CONSTRUCTION IN PARIS.

construction ground into their desired place above the river bed. When the caissons are sunk under the river, end to end, the iron plating on the ends is removed, and the three caissons thus form a continuous tunnel. Such caissons weigh about 300 tons.

In order to sink the caissons into place a structure of upright piles is built in the river bed and it rises to some distance above water level. The caisson is surrounded by this framework, and it is thus kept steady and is guided as it sinks below the river bed. After being floated into place the caisson is lowered down to the river bed. The latter had been excavated to 16 feet depth in order to give a starting point for the further operation of sinking the caisson. The space between the iron tube and the sheet-iron walls was filled with concrete so as to give a solid structure and the inner tube is filled with water in order to increase the stability. Then the workmen who are lodged in the under chamber of the caisson proceed with the excavation in the usual way, sending the material up through the shafts.



END VIEW SHOWING CONSTRUCTION OF MIDDLE CAISSON IN PARIS UNDERGROUND RAILWAY STATION.

In this way all the caissons have now been sunk into place under the river bed in both arms of the Seine. There is left an interval of about five feet between the ends of the caissons, and this is occupied after the sinking of the latter by a small caisson which serves as a means of junction. When the whole is in place the sheet-iron lining of the end walls is removed so as to give a continuous tunnel.

At this part of the line it was desired to have two underground stations, one in the City Island and a second at Place St. Michel. In order to place these in the water-soaked ground, the constructors were obliged to build them of metallic caissons at the surface of the ground and then to sink them in place.

Taking the case of the St. Michel station, it is formed of a central caisson which has the general section of the station in the interior. A skeleton frame of ironwork had to be built in order to form the main support. Against the curved trusses of the frame were riveted iron plates in order to give the inner lining of the elliptical station. The truss structure was built on the outside with vertical uprights so that the whole could be given an outer covering of sheet iron. This makes up a box-caisson, as in the former case, but what is remarkable is its large size, as it measures 223 feet in length and is 54 feet high.

To provide for the approaches of the station it was necessary to build an immense circular caisson at either end of the approaches. These caissons have a somewhat elliptical form, however; the larger axis measures 85 feet and the smaller axis 61 feet. The construction differs completely from the other, and each caisson is made up of vertical sheet-iron inner and outer rings, held upon a skeleton frame. The whole may be compared to an immense barrel, which is sunk below the ground. Concrete is filled in the interval between the plating. This leaves an inner area which is used to give access to the main station, and contains the approaches. The whole structure with the middle and end caissons is nearly 400 feet long, and the total weight is 28,000 tons of iron and cement. At present the structure has been sunk to the required level below the Place. Connection is made between the river structure and the two stations in the compressed-air shield system.

HIGH-VOLTAGE MEASUREMENTS AT NIAGARA.

A long paper entitled "High-voltage Measurements at Niagara" was presented to the American Institute of Electrical Engineers at the Atlantic City convention on June 30, 1908, by Ralph D. Mershon of New York. In the autumn of 1896 the writer of the paper undertook an investigation of the phenomena existing when transmission line conductors are subjected to high alternating voltages. The work was carried on near Telluride, Colo., and extended over a period of about a year. The results of this work were embodied in a report made by Mr. Mershon in 1897.

Through lack of the necessary facilities at Telluride, the work was not carried as far as seemed desirable, and after its discontinuance the author looked forward to taking it up again and obtaining additional data. This opportunity offered in 1903, and in the autumn of 1904, after the necessary apparatus had been obtained, the work was resumed at Niagara Falls, and the observations carried on more or less continuously until the summer of 1907.

In the meanwhile Prof. Harris J. Ryan read before the Institute his paper bearing on this subject and embodying the results of investigations made by him of some of the points Mr. Mershon had intended to cover and a number of others which the latter's facilities would not admit of closely investigating.

The work at Niagara, Mr. Mershon said, was made possible in the first instance by the generosity of three men—Mr. J. E. Aldred, Mr. Frederic Nicholls and Mr. James Ross. Later, further support to the work was contributed by Mr. George Westinghouse and by the African Concessions Syndicate of London. The major portion of the expenses of the work at Niagara was defrayed by the above contributors.

The writer expressed his appreciation not only of the generosity of these contributors, but also of the completeness with which they entrusted the expenditures to his judgment and the kindly patience with which they have awaited results so long deferred by reason of the tedious, intricate and often discouraging nature of the work. He wished that engineering investigation might be more encouraged in a like manner and spirit and hoped that the results obtained will appear to justify the contributors in this instance.

The matter of this paper is arranged under the following heads: Equipment; results of measurements; discussion of results; résumé and conclusions. After describing the equipment, giving the results of measurements and discussing the results, Mr. Mershon arrives at the following conclusions:

1. That with a given conductor at a given spacing and under given atmospheric conditions there is a certain voltage or "critical point" at which a very appreciable loss begins to occur through the atmosphere.

2. That there may or may not be an appreciable loss existing below this critical point, depending upon the atmospheric conditions.

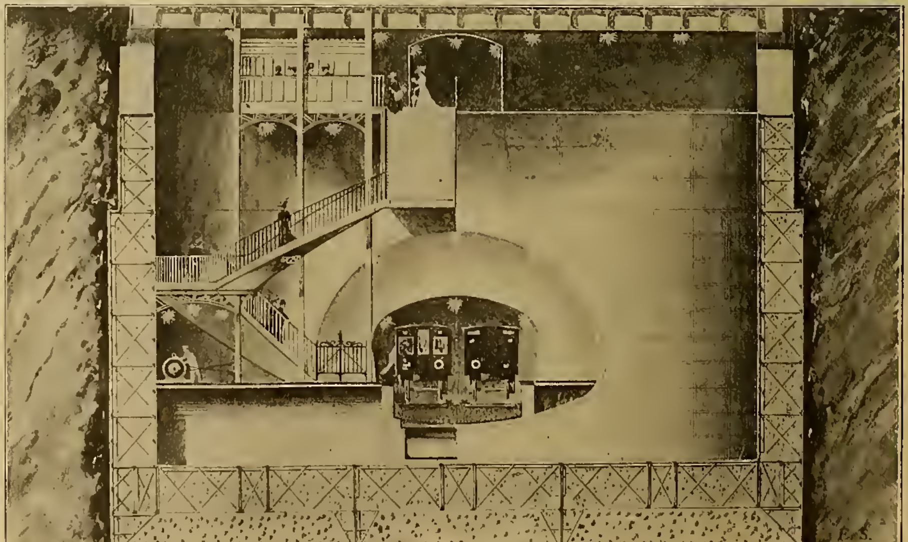
3. That the presence of floating particles in the atmosphere may produce a loss below the critical point. (Ryan.)

4. That the presence of moisture in the atmosphere may produce a loss below the critical point.

5. That the presence of moisture in the atmosphere affects the loss both above and below the critical point.

6. That the presence of moisture or floating particles in the atmosphere affects the position of the critical point (i. e., the value of the critical voltage).

7. That the critical point corresponds to a partial breakdown of the dielectric.



END CAISSON FOR ACCESS TO PARIS UNDERGROUND RAILWAY STATION.

8. That the critical point coincides with the voltage at which luminosity or hissing (or both) of the conductors begins.

9. That the critical point depends upon the maximum value of the electromotive force wave and the distance between the conductors.

10. That the critical point depends upon the local rate of fall of potential or dielectric stress at some point in the atmosphere, and therefore depends not only upon the maximum value of the electromotive force wave and the distance between the conductor, but also upon the diameter of the conductors. (Ryan.)

11. That there is a loss over insulators which is

affected by the moisture conditions of the atmosphere.

12. That the variation of the atmospheric loss between conductors, the variation of the loss over insulators and the variation of the critical point due to the moisture conditions of the atmosphere bear to the vapor product (i. e., the product obtained by multiplying the vapor pressure by the relative humidity) a definite relation which, so far as is at present known, is an empiric one.

13. That the loss over insulators in a fog is very much higher than the loss in dry air and somewhat higher than that in a heavy rain.

14. That the smoother the surface of the conductor the less the loss and the higher the critical point.

15. That the stranding of the line conductors reduces the loss and raises the critical point due to the increase of the equivalent diameter of the conductor.

16. That the increase of the equivalent diameter of the conductor is greater the greater the number of strands.

17. That the weathering of conductors (or at any rate the aluminum conductors and probably copper also) does not appreciably increase the loss or lower the critical point.

18. That the loss and critical point are the same for copper and aluminum under the same conditions.

19. That anything which increases the charging current of an insulator increases the loss over the insulator.

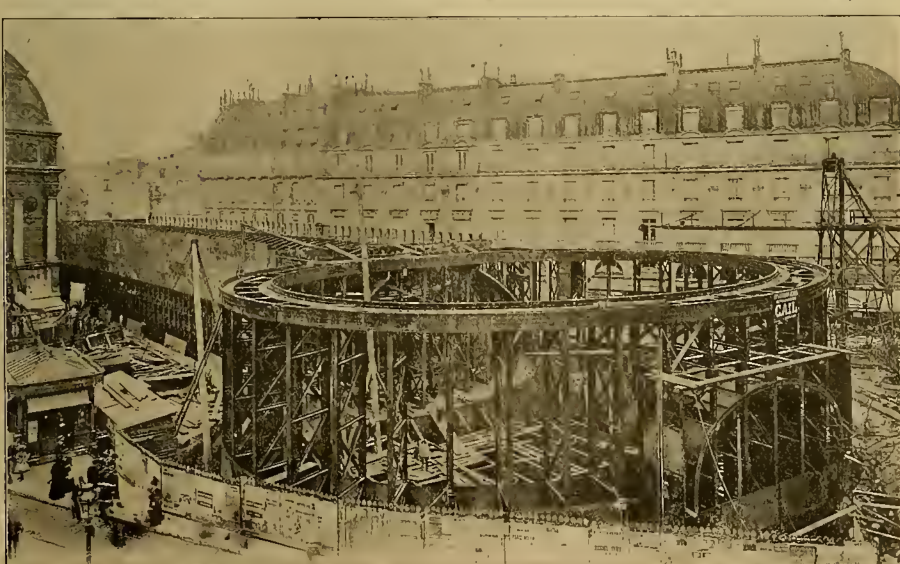
20. That the loss over an insulator on a wooden pin is greater than that over an insulator on a metal pin, because the resistance of the wooden pin is in series with the charging current of the insulator.

21. That the atmospheric loss between conductors and the loss over insulators decreases with the frequency. The law of the decrease is not at present accurately known.

22. That neither the critical point nor the loss between cables is affected by variation in the distance of the cables from the ground.

STREET-RAILWAY REHABILITATION IN ST. LOUIS

The United Railways has begun reconstructing 25 miles of road and track in different parts of St. Louis. The improvements will cost $30,000 a mile, or approximately $750,000 in all. General



END AND MIDDLE CAISSONS IN PLACE ST. MICHEL STATION OF PARIS UNDERGROUND RAILWAY.

Manager Robert McCulloch says that at least 25 miles of road and track will be rebuilt every year until all the lines are rebuilt. Work of reconstruction has been done on the Broadway, Bellefontaine and Tenth Street lines. About 3,000 laborers are engaged in this construction.

All the improvements correspond to the reconstruction standard used on Olive Street. The hewn cypress tie, six by eight inches in section and seven feet long, and the steel rail, weighing 112 pounds to the yard, and nine inches in height, with a 5.5-inch base, are laid in a bed of solid concrete 12 inches thick. By this process the rail, the tie and the concrete bed form one solid mass.

A GREAT CORN PRODUCTS PLANT ELECTRICALLY OPERATED

By C. A. Tupper.

From American maize, or corn, as it is commonly called in this country, a greater variety of marketable commodities are made than the average person would ever imagine, and among the most valuable of such products are those of the great glucose factories. To the capital financing these plants, which are very expensive to construct, and

MIDDLE CAISSON OF PARIS UNDERGROUND RAILWAY STATION.

to the engineers responsible for their design, credit should be given for true pioneer work—work in the interest of all the people, producers and consumers alike; for it has added immeasurably to the wealth and available resources of the country.

Owing to the first cost only a very few such plants have been constructed, the latest notable addition to them being that of the American Maize Products Company at Roby, Ind., a suburb of Chicago. It is only when one traverses structure after structure and floor after floor devoted to the manufacture of corn syrups, jellies, glucose, grape sugar, starch and numerous varieties of special feedstuffs that any adequate conception of the size of the works is possible. Furthermore, it is seen to what an extent electric drive has been introduced and how important is the part it plays in economical operation as indicated briefly by the following description:

Process of Manufacture.

The corn, which in all cases forms the raw material, is brought in on cars, weighed, elevated, cleaned, weighed again and then sent to enormous storage tanks, whence it is taken as needed.

First of the manufacturing processes is that which takes place in the steep house. The tanks here hold about 2,000 bushels each, and the steeping mixture is sulphurous acid, in which the corn is kept for 30 to 40 hours at a temperature of 100° to 115°.

The acid water is then drawn off and the corn conveyed to machines known as "degerminators," where it is crushed sufficiently to free the germ; then pumped to the germ separators, where the germ is floated off. This germ is used for one of the most valuable of the by-products. The crushed corn, being removed from the bottom of the separators, at one end, is then run over shaking sieves to remove the free starch.

The bulk of the mass, however, tails over the end of the sieve into a supply tank, whence it is fed into buhr stone mills. There it is ground very fine. The product of these mills is then pumped into troughs and fed onto shaking silk-covered sieves, where streams of water play on the mass, washing the starch out through the sieves and leaving the ground hulls to pass over the end and into feed-mixing tanks.

The starch removed in the two processes above described and all surplus of starch obtained from various other processes is then collected in a tank and pumped to the settling basins, where the starch is continuously concentrated. Here the surplus water passes off at the top and the starch settles to the bottom, whence it is pumped into pipes feeding shaking sieves covered with fine bolting silk, where the particles of meal that still cling to the starch are removed and sent back to be reground.

The starch after passing through the sieves is about the consistency of cream and is pumped to table feed tanks on the top floor of the building, thence fed onto starch tables; each table is about two feet wide and 110 feet long. Here the starch settles on the bottom and the gluten and water and a great many of the impurities float off and go to the gluten concentrating tanks, where the gluten is freed from most of the water and pumped to feed-mixing tanks.

When a set of starch tables has been run a sufficient length of time for an accumulation of about six inches of starch at the head, or feeding end, tapering to nothing on the other end, it is then of about the consistency of wet clay. In this state it is shoveled onto belt conveyors and conveyed to breaker tanks. There water is added, the starch thoroughly washed, pumped into table-feeding tanks and retabled, the water passing over the end mixing with water and gluten of the first tabling. The starch is now ready to be made into glucose, sugar or dry starch.

Electric Drive.

During all of the processes thus far described, power is applied wherever needed by means of alternating-current motors of the induction type, built by the Allis-Chalmers Company of Milwaukee. Most of these are of standard construction, but the motors connected to the buhr mills are special machines, having been developed for this specific purpose.

Each is of the vertical belted type designed for operation on 60 cycles and has a normal rated output of 75 horsepower. The stator core is supported in a cast-iron housing provided with projecting lugs that rest on the slide rails. The stator core shows open slots that allow the coils to be readily removed in case repairs are necessary. The stator has a 14-pole winding, thus giving a synchronous speed of 514 revolutions per minute, the full-load speed being approximately 490 revolutions per minute.

The rotor spider is mounted on a vertical shaft which passes through a guide bearing at the top of the motor. A second guide bearing is placed at the bottom and the weight of the rotating part is carried by a multiple disk, self-aligning, thrust-bearing under the lower end of the shaft. A complete oiling system is provided whereby oil is supplied to the upper bearing from a large sight-feed oil cup, and after passing through this bearing flows to the lower one. The thrust-bearing is designed so that all parts are thoroughly lubricated. The pulley is at the top of the motor and the vertical arrangement allows the motor to be belted directly to the mill without the use of a quarter-turn belt.

In addition to the buhr mills the elevators, conveyors, shaking sieve, and in fact all of the moving machinery referred to are driven by motors of capacities ranging from five to 30 horsepower. Some of the larger sizes are, however, required in the later processes, as will be mentioned in the proper place.

Glucose and Sugar.

If the starch is to be made into glucose or sugar, it is shoveled from the tables onto belt conveyors and conveyed to breaker tanks, where fresh water is added until the starch is made into a liquid having about the consistency of cream. Then it is pumped into the starch tanks in the refinery and from there discharged into copper converters. In these converters it is mixed with hydrochloric acid and subjected for about 10 minutes to 40-pound steam pressure. Then it is blown to neutralizers, where soda ash is added to neutralize the acid, and allowed to run through canvas-lined filter presses, which remove the coarse impurities.

Further filtering then takes place through tanks filled with bone-black, and as the liquid issues from these it is pumped to feeding tanks and passed into evaporators, where some of the water is evaporated and the specific gravity of the liquor raised from 15° Baume to about 30° Baume. It is then pumped from these continuous evaporators, which are triple effects, to filter feeding tanks, where it is again allowed to filter through bone-black and then pumped to pan-feeding tanks, drawn into finishing vacuum pan and concentrated to 42°, 43°, 44° or 45° Baume, as may be desired. When the batch is finished a valve on the bottom of each pan is opened and it flows by gravity to the coolers.

If glucose, it is now ready for the barrels, tank cars or syrup departments; if sugar, for the barrels or to be sent to the crystallizing pans if it is to be shipped.

Syrup.

If the glucose is to be made into syrup it passes to the syrup mixing tanks, where a certain percentage of glucose, cane syrup and flavoring extracts are thoroughly mixed by air agitation. The resulting syrup then goes to the can-filling machines on the floor below, where it is put up in air-tight, friction-top tin cans, packed in boxes and loaded on cars for shipment.

Dry Starch.

If the product from the corn is to be made into starch it is shoveled from the tables onto belt conveyors and conveyed to the starch drying house, where it is placed on trays covered with burlap, put into steel rack cars and run into drying tunnels, each of which will hold 11 cars.

When a car at the "hot" end is removed another on the wet or "cold" end takes its place, 12 to 15 hours being required for a car to pass from one end to the other so as thoroughly to dry the starch.

On the hot end of the tunnel there is an iron grating covering underground ducts connected with large fans, each fan being 12 to 14 feet high and driven by a steam engine direct-connected. Each fan has in connection with its steam coils composed of about 25,000 feet of one-inch pipe, through which the air from out-of-doors is drawn and heated to about 180° F. and blown through the tunnels. One fan usually supplies heat to about 10 tunnels.

When the cars are removed from the tunnels they pass onto a transfer truck, also running on rails, and are brought to rails running parallel to the tunnels, where the starch on the trays is dumped into hoppers which feed the starch into elevators. By these it is raised to the third story and conveyed to the grinding and storage building, where the dried starch passes through grinding mills and reels and sifters covered with silk bolting cloth and from there to bins and packers. With the exception of the fans, all of the apparatus mentioned is motor-driven.

By-products.

Of almost equal importance to the commodities mentioned above are the by-products of the various processes—gluten feed, corn oil, oilcake and fertilizer mixture.

The gluten feed is composed of the ground hulls that tail over the silk sieves and go to feed-mixing tanks, where the gluten from the tables also finds its way. In these tanks it is thoroughly agitated and then pumped through large canvas-lined filter presses. When a press is full it is opened and one plate after the other is dumped into screw conveyors under the presses and conveyed to the feed dryers. The feed then contains about 60 per cent. moisture.

The dryers are large revolving cylinders with a number of boiler flues running longitudinally, in which there is steam. The feed is on the outside of these flues and, in coming in contact with the hot surfaces, the water is driven out and the air passing through the dryers carries the moisture off through ventilating stacks.

The feed to be dried, brought from the filter presses in the room adjoining, is transmitted to the dryers by an elevator and conveyor, being fed from the floor immediately above the machines and through spouts to the hoppers of the machines. In the bottom of the hoppers there are conveyors for carrying the feed into the dryers. These dryers being set slightly on an incline, the feed gradually advances through the machines by gravity, taking from 20 to 30 minutes in the process.

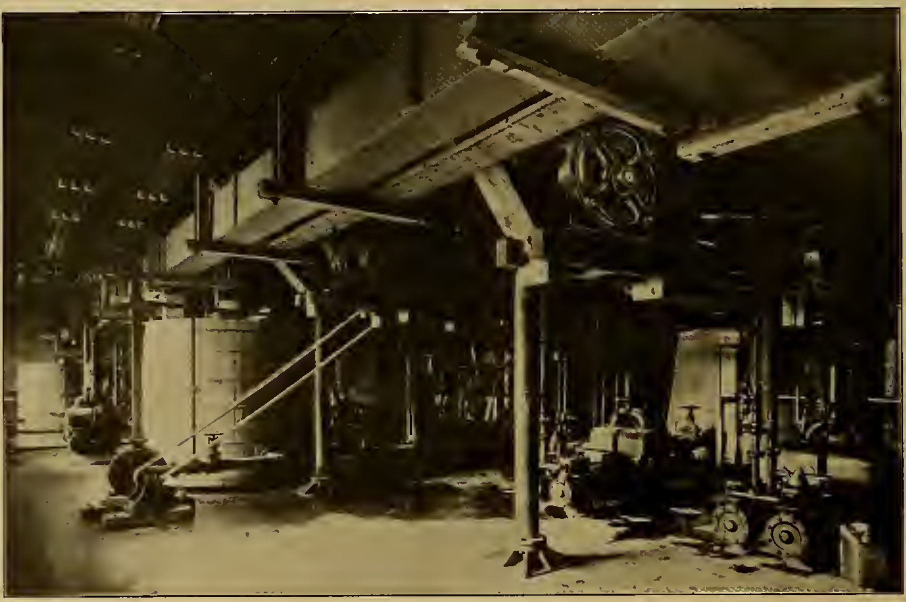
Charcoal-iron boiler tubes run the entire length of the cylinder, which is 25 feet long. The tubes are expanded at each end into manifolds and back of the tubes and between the tubes and the shell is a hardwood lining which prevents radiation and protects the iron from the acids contained in the feed. Back of each separate tube is a flight. These tubes and flights form pockets for carrying up the meal while in process of drying.

The condensation in the tubes is carried out and through a stuffing box to a trap which discharges the water back to the boiler heater at almost boiling temperature. The tubes and manifolds are kept free from the condensed water, which is a very important feature, as it gives the material to be dried the full benefit of the temperature of the live steam at 60-pound pressure.

The turning apparatus, propelled by shafting from a 40-horsepower motor, through gearing giving three reductions, gives an exceedingly easy drive, rotating the cylinder on heavy bearing tires and double trunnions with an expenditure of not to exceed five or six-horsepower to a machine.

When the feed leaves the dry end of the dryers it is conveyed to a fan, which blows it to the feed-grinding house. Here the feed is thoroughly ground and put through reels covered with very fine wire screens, and only feed of a uniform fineness is allowed to pass from the reels to the storage bins, where it is ready for shipment. The coarse tailings from the reels go back to the mills to be reground. The grinding is done by attrition mills, each mill belted direct to two 40-horsepower motors.

Corn oil is obtained from the germ which is floated off at one end of the separators, passed over shaking sieves and sprinkled with water to detach the particles of starch adhering to it (which are conveyed by a separate channel to the rest of the starch), the germs tailing over sieves to a conveyor feeding expeller, where the water is squeezed out. This material, then containing about 60 per cent. moisture, next goes to the germ dryers, which are similar to those used for drying the gluten feed.



INDUCTION MOTORS IN GLUCOSE FACTORY.

Here the germ is dried down to about four per cent. moisture and elevated to a cleaner, where all foreign matter is eliminated, the clean germ going to motor-driven roller mills, thence to a steam-jacketed conveyor which conveys it to oil expellers, where the oil is squeezed out. It then flows to a tank and is pumped through a filter press, where all meal, etc., is removed. The filtered oil flows to settling tanks in the oil-storage and shipping house and is then ready for the barrels or tank cars.

The Anderson oil expellers, of which four have been installed in this plant, are continuous in operation, and not only press the germs continuously but also perform this work without the use of press cloths or mats. They are driven by a 40-horsepower motor.

The tempering apparatus is to take the place of the old-fashioned heater and also works on a continuous principle. The mode of operation, as above indicated, is first to grind the germs, after which they are fed continuously into the tempering apparatus and thence into the expeller, where the oil is pressed or extracted from the germ meal.

This machine is not only very economical in operation from the fact that one man can take care of an entire battery, but it has also twice the capacity of the hydraulic press, and produces a superior grade of oil, due to the fact that it extracts the oil at a lower temperature than that required to obtain it by the hydraulic process.

The residue leaving the oil expellers is known as corn-oil cake and is conveyed to a grinding mill, where it undergoes the same process as in grinding feed; then to the cake bins and sacks and is ready for shipment.

The pores of the bone-black in the filters used for the syrup process become filled with impurities after several hours' use, and the filters are then thoroughly washed and steamed and the impurities removed through a manhole at the bottom; thence the latter are elevated and discharged into dryers, where the material is dried by the waste gases from the kilns below. The bone-black passes from the dryers through retorts in kilns and then through cooler pipes, automatically discharging onto a belt conveyor, where it is conveyed to a bucket elevator and elevated to a cleaner. There all dust and impurities are removed (this material being sold for fertilizer purposes) and the bone-black is discharged into a storage tank and again to the filters, new bone-black being added to take the place of the dust, etc., that is removed by the cleaner. The kilns are fired with producer gas, supplied by Morgan gas producers.

Pumping Machinery.

Not the least important part of this great plant is the pumping machinery, which consists of two 12 and 18 by 14 by 18 duplex pumping engines of the outside center-packed plunger type, each having a capacity of 1,400 gallons of water per minute. Three single-stage centrifugal pumps for the steeps have each a capacity of 200 gallons per minute. These pumps are placed on extended bases and direct-connected to 7½-horsepower motors. The shaft, coming in contact with the liquor, was made of bronze composition. One single-stage centrifugal pump for the shakers has a capacity of 400 gallons per minute. This is direct-connected to a 15-horsepower motor.

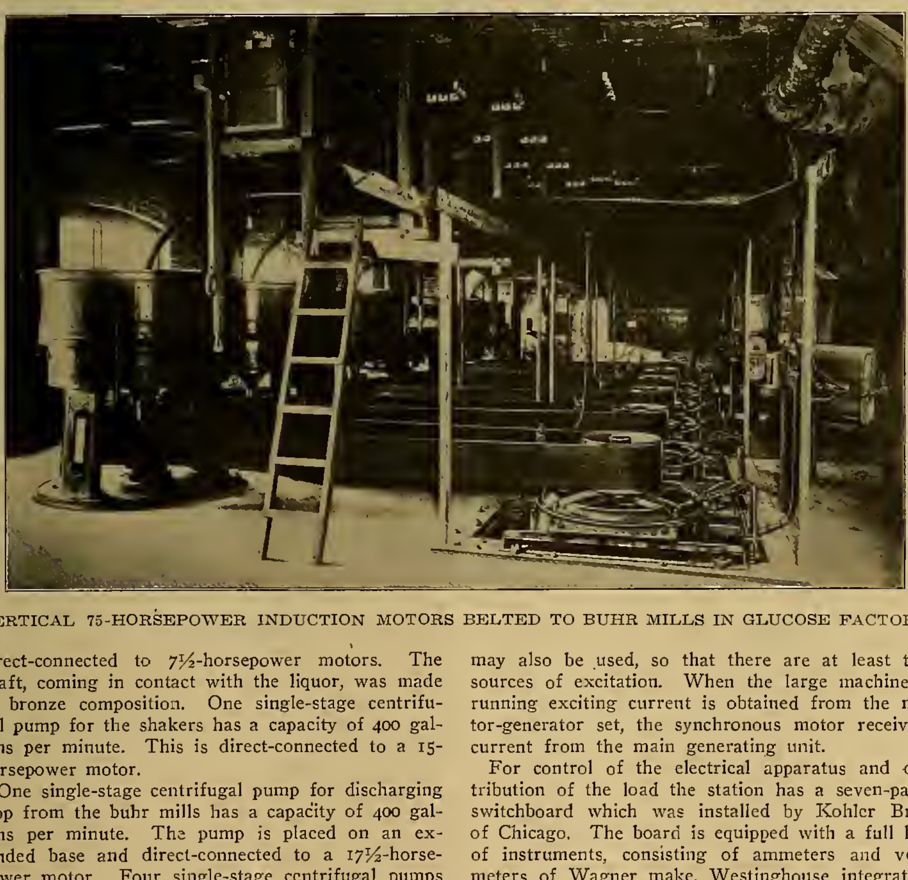
One single-stage centrifugal pump for discharging slop from the buhr mills has a capacity of 400 gallons per minute. The pump is placed on an extended base and direct-connected to a 17½-horsepower motor. Four single-stage centrifugal pumps are provided for crushed corn, each direct-connected to a 15-horsepower motor. One single-stage centrifugal pump is used for the starch-breaker. It has a capacity of 400 gallons per minute and is direct-connected to a 15-horsepower motor. One single-stage centrifugal pump for water has a capacity of 700 gallons per minute, direct-connected to a 22-horsepower motor.

The centrifugal pumps are of the balanced type, with single-suction opening. The casing is circular and concentric, fitted with discharge flange and with feet for bolting to foundation. The suction is on the drawing side and admits the water to that side of the casing. It passes through cores in the chute case to the front end of the impeller, so that the impeller has suction on each side and is consequently balanced. In addition to the pumps mentioned there are several others.

Power House.

The power plant of this establishment has been designed in strict accordance with latest practice and possesses many features of special merit. In the engine room there is but one large main unit, which is a 26 and 44 by 48-inch Allis-Chalmers cross-compound Corliss engine, connected to an alternator of the same company's build and having a normal rating of 800 kilowatts. The generator is a three-phase, 60-cycle machine of the revolving-field type and was designed to deliver 480 volts pressure at a speed of 90 revolutions per minute. The rotor of the generator is about 17 feet in diameter and weighs 17 tons. The load carried by this machine is mostly power, consisting of 150 motors ranging in capacities from five to 75 horsepower each. There is, of course, a sufficient number of incandescents to light the plant. The lights are carried on three-phase feeders and as nearly as possible are distributed equally between the phases. From four to six hours a day the large unit is run on 25 per cent. overload and apparently carries it with the greatest of ease.

Besides the large unit there is a smaller direct-connected set consisting of a 14 by 14-inch Chandler & Taylor engine and a three-phase Allis-Chalmers revolving field generator. To this set is also belted a 35-kilowatt direct-current exciter. The small set is used only at night or any time when there is a very small load to carry. When starting up the larger unit it is also used for exciting current, the three-phase alternating current being transformed to direct current by means of a 50-kilowatt motor-generator set. The belted exciter may also be used, so that there are at least two sources of excitation. When the large machine is running exciting current is obtained from the motor-generator set, the synchronous motor receiving current from the main generating unit.



VERTICAL 75-HORSEPOWER INDUCTION MOTORS BELTED TO BUHR MILLS IN GLUCOSE FACTORY.

For control of the electrical apparatus and distribution of the load the station has a seven-panel switchboard which was installed by Kohler Bros. of Chicago. The board is equipped with a full line of instruments, consisting of ammeters and voltmeters of Wagner make, Westinghouse integrating and recording wattmeters, a Westinghouse synchroscope and power-factor indicator. Condit three-pole circuit-breakers are installed and Cutler-Hammer chain-operated field rheostats.

In the same room but at a lower level than the power-plant floor are some of the pumps—that is, the two feeding engines for water supply, the two boiler-feed pumps and the two Underwriter fire pumps. In addition to the pumps are two Stilwell feed-water heaters with space for a third, and also an air compressor to furnish the shop with a supply of compressed air for pneumatic tools, etc.

Boiler Room.

On account of the large demand for steam throughout the plant there are six Aultman & Taylor boilers installed, each rated at 440 horsepower, set singly, and each having 4,403 square feet of heating surface. The boilers carry a pressure of 150 pounds per square inch, and five of them are in constant operation, with one down for cleaning or repairs. They are equipped with chain-grate stokers and are run with natural draft supplied by a radial brick stack. The stack is 200 feet high from the boiler-room floor, which is six feet above grade, 10 feet in diameter all the way up, and has a radial brick lining for 60 feet of its height. It is located right in the boiler room midway between the two middle boilers and has a flue opening on either side with a six-inch baffle wall in the middle to prevent interference of draft. For a brick stack the location is unusual, and a peculiar feature is the passageways under the stack. These are at right angles to each other and are on a level with the boiler-room floor. A cable is drawn around the top of the chimney and is provided with four points, each having a 12-inch platinum tip. Two ground connections are provided and the cables are secured to the chimney by means of bronze anchor fastenings.

Special care was taken in the design of the breeching, which was built up of brick and covered with reinforced concrete. As above indicated, there are three boilers on each side of the stack, so that there are three boilers discharging their gases into each breeching. On this account the area at the entrance to the stack was made equal to three times the area of the outlet from the boiler, twice as large between the second and third boilers and at the first boiler of the same size as the outlet. This arrangement gives each boiler an equal draft and prevents any choking of the gases in its passage to the stack.

Feed water for the boilers is taken from Wolf Lake, which is only a few feet from the plant. The water in this small lake is unusually muddy and it was necessary to install a filtration plant for its purification.

For the supply of the entire works the water is drawn from the filtration plant through a 12-inch pipe by one of the pumping engines previously mentioned. To this main supply a four-inch tap is made for boiler feed, and before reaching the boilers the water is passed through the Stilwell feed-water heaters, which are 12 feet 9 inches high and 66 inches in diameter. The heaters raise the water to a temperature of 200° F. But little cold water is required, however, as the condensation from traps and exhaust is usually sufficient.

To collect the ashes each boiler is provided with an ash hopper, from which the ashes are taken in small dump cars. These cars are pulled mechanically outside of the building and the ashes are dumped on the premises and used for filling purposes.

As the coal used in the stokers contains considerable dust after passing through the crushing machine there is a good deal of fine material which will drop through the chain grates, and in a great many cases is entirely wasted. In the plant under description, however, each hopper is provided with a plate to divert the fine coal dropping through in this manner. Provision is now being made to convey this fine coal to the elevator and eventually return it to the stokers.

Steam Piping.

Two steam headers have been provided—the main header, which is 16 inches in diameter, and an auxiliary header eight inches in diameter. With the piping arranged as in the drawing it is possible to utilize either header and cut out, if necessary, either half of the main header for repairs. From one to the full number of boilers can be turned onto the headers, as desired, and there is no danger of any pumping back and forth between the boilers from unequal pressures, as each header is equipped with an automatic stop valve.

Live steam is used to some extent in the plant, especially for the fan engines, steam dryers and pumps in connection with the drying rooms. Most of the steam, however, used for the various processes is exhaust from the engine units and the pumps. For this reason condensers were not installed. This supply of exhaust steam is collected in a large 18 and 20-inch pipe, and at infrequent intervals when the steam is not all required in the plant it is exhausted to atmosphere.

Coal-handling Facilities.

Of the entire boiler room the feature of chief interest is undoubtedly the coal-handling apparatus. This is unusually complete for a plant employing only six boilers.

A receiving conveyor has been placed parallel with the track on which the coal arrives, being between the track and the wall of the boiler house. The conveyor is provided with a hinged shoveling apron placed at an angle of about 60° between it and the side of the car. To this apron the coal is shoveled and flows down on the conveyor and is

[Continued on page 46.]

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

CHICAGO is undoubtedly the electrical trade center of the United States, and it is pleasing to note the ungrudging testimony to this fact borne by one of our New York electrical contemporaries, as quoted in the Western Electrician last week. Nowhere else in this country, perhaps, are electrical activities so diverse, alert and representative of the latest and most progressive ideas. The volume of electrical trade transacted in this city annually is very large, and the men engaged in electrical pursuits here are distinguished by public spirit and a willingness to co-operate for the good of the industry. Chicago has exceptional facilities for the production and distribution of commodities, and its merchants, manufacturers and jobbers are broadly American in spirit, thoroughly in touch with all sections of the country, and withal diligent in business. Not only for its own uses of electricity but for its importance to the industry at large, Chicago may well be known as the Electric City.

JULY 1, 1908, is a date of some importance in radio-telegraphy, for it is the day when the Berlin radio-telegraphic convention went into force in Great Britain, France, Germany and many other countries. If we are correctly informed, the United States Senate failed to confirm the treaty or "convention," although President Roosevelt and his administration favored it. One of the main objects of the convention is to insure intercommunication between coast stations and ship stations without regard to the particular system of radio-telegraphy adopted by these stations. Particular stations can be exempted from this obligation, however. The service conditions drafted at Berlin provided for the use of standard wave lengths of 300 and 600 meters at all stations open for public service, the former being regarded as normal for ship stations. For long-distance stations, or stations used for other than public correspondence, wave lengths above 600 but not exceeding 1,600 meters may be used.

AN INTERESTING paper on the subject of the inconsistencies in the present international terminology relating to illumination was contributed to a recent issue of the Journal für Gasbeleuchtung of Germany by Dr. B. Monasch. The author points out that the word "lux," to denote the unit of intensity of illumination, has found its way into general acceptance with unusual celerity, and appears in almost all the works which have been published in France and Germany since the year 1900. It has the merit of containing neither a unit of light nor a unit of length. A word used to denote a unit is preferably a name pure and simple rather than an attempt at definition. It is desirable, says Dr. Monasch, that there should be one definite unit of intensity of illumination, with international recognition, and the universal adoption of the word "lux" for this purpose is favored. Different nations would then be at liberty to utilize the units which they individually preferred in measurement and calculation, but the ultimate results should be converted into lux by multiplication by a suitable factor. In Germany, specifically, the word "meterkerze" (or candle-meter) ought now to be taken from the list of photometrical quantities and replaced by the word "lux." In like manner, "candle-foot" and "candle-meter" would disappear in the United States and Great Britain.

THE MOVEMENT for a "sane Fourth," or a celebration of Independence Day that shall not be dangerous to life and limb, health and property, is gaining ground, as well it may. We suggest that central-station managers and other electrical men make an effort to cause special electric-lighting displays, in suitable patriotic designs, to be used in place of fireworks to a considerable extent.

Electric-sign designers have already produced moving light effects, in various colors, which have much the appearance of fireworks and which can be witnessed without the slightest danger, either to operator or spectators. Then, too, most impressive effects may be produced by the searchlight.

A traveler who returned last year from British Columbia by steamship on Puget Sound relates that after dark his vessel passed a squadron of American warships celebrating the Fourth by searchlight drill. As the climax nearly all the lights on the ships were turned out and all the beams of light from the projectors on the other vessels were turned on the American flag floating at the stern of the flagship. The flag stood out in the night in vivid beauty, and the narrator describes the spectacle as indescribably thrilling, especially, as, after a breathless moment, the band broke out into the strains of "The Star-spangled Banner."

Such a display as this might well form the conclusion of a public Fourth of July celebration in the large cties of the country in 1909. And the searchlight illumination prior to the climax might be something after the order of the very impressive spectacle of this nature given at Niagara Falls in September of 1907, where thousands of beholders were awed into silence. Provided with a suitable location and sufficient funds (the amount would not be prohibitive) the electrical illuminating engineer could provide a festival of lighting effects that would make the celebraton of the day memorable.

Let the Fourth of 1909 be an Electrical Fourth.

ARTIFICIAL LIGHTNING, so called, is a term often used, in a loose, general way, to apply to high-potential electrical discharges, but artificial thunder has not yet been created. In nature the roll of thunder usually follows lightning, but the sharp, explosive sound of "artificial lightning" is quite different. Prof. John Trowbridge of Harvard University, in his memoir on "High Electromotive Force," notes this fact. Professor Trowbridge's storage battery of 20,000 small cells enabled him to experiment with electromotive forces up to 40,000 volts. He concluded that the most powerful electric discharge which we can produce by modern appliances is a faint shadow of lightning—so faint that it fails to reproduce in most essential respects the phenomena in the heavens. "I have never been able," he says, "by the use of resonant tubes or other arrangements, to cause reverberations to reproduce in the slightest degree, even with sparks six feet in length, the rolling of thunder. The energy of an ordinary lightning discharge must be enormous." Professor Trowbridge lays stress on the fact that current as well as potential should be considered in studying phenomena of this sort. He thinks that if Benjamin Franklin had worked with a high-tension storage battery, he probably never would have dared to try his celebrated kite experiment.

NINETY-FIVE PER CENT., in amount, of the merchandise creditors of the Westinghouse Electric and Manufacturing Company have assented to the plan of reorganization proposed by the merchandise creditors' committee, and it is confidently expected that the assent of nearly all of the remaining five per cent. will be secured by September 1st, to which date the completion of the settlement has been postponed. It is to be hoped that no hitch will prevent the carrying out of the proposed plan, which seems to be a good one, and which will accomplish the result, much desired, we believe, by all interested in the electrical industry, that the great Westinghouse company be released from receivers' control and set on its own feet. The merchandise creditors' committee does not overstate the importance of the matter in the following earnest words: "We are unwilling to believe that the few remaining individuals and firms whose consent and assistance are still needed will wish to assume the responsibility for a failure of this effort, when, with their co-operation, the success of the merchandise creditors' plan and the discharge of the receivers are assured." The Western Electrician trusts that the appeal of the committee will be heeded.

A notable instance of loyalty is afforded by the fact that about 5,000 of the company's employes have made cash subscriptions amounting to about $600,000 of the $6,000,000 of "assenting stock" required by the plan. This is about 10 per cent. of the amount required. It will certainly be a pity if this fine effort comes to nothing; fortunately, there is every reason to hope that such will not be the case.

WESTINGHOUSE READJUSTMENT

Dated at New York, July 6th, the merchandise creditors' committee of the Westinghouse Electric and Manufacturing Company, sends out the following circular letter to the merchandise creditors:

"Your committee is gratified to be able to report that 95 per cent. in amount of all the merchandise creditors have assented to the merchandise creditors' plan, and that they confidently expect to secure the assent of the major part, if not all, of the remaining merchandise claims.

"Substantial progress has been made toward securing from stockholders, employes and others the $6,000,000 of cash subscriptions to 'assenting stock' required by the plan; and additional subscriptions for a considerable sum are assured; conditioned upon the subscribers being able to make satisfactory financial arrangements therefor.

"It is, however still necessary to secure the remaining cash subscriptions as well as the assents from the remaining merchandise creditors.

"Of the employes of the company, approximately 5,000 have made subscriptions aggregating about $600,000. This action on the part of the employes should be an incentive to creditors and stockholders of the company to furnish as promptly as possible the remaining subscriptions required for the complete success of the plan.

"In consideration of the extraordinary effort which has been made by all parties interested, and the favorable results accomplished to date, the readjustment committee has agreed to a further extension to September 1st, within which finally to complete the matter.

"By request of your committee, jointly with the other committees interested in the plan of rehabilitation, the receivers have heretofore applied to the court for an order directing them to pay interest due July 1st, and the order has been granted and payment has been made accordingly."

The merchandise creditors' committee consists of Joseph W. Marsh of Pittsburg, chairman; F. W. Roebling, Charles R. Remington, A. Bournonville and George M. Verity, secretary. Its office is at 165 Broadway, New York.

Enclosed with the letter of the merchandise creditors' committee are the following extracts from the announcement of the readjustment committee of creditors dated July 1st:

"The above-named committees [of merchandise creditors, stockholders, Security Investment Company creditors and employes] united in a request that by reason of their substantial progress the time within which to obtain the balance of the subscription be extended to September 1st, and requested that this committee co-operate under such merchandise creditors' plan. Upon the strength of the progress reported by these committees and upon statements of account furnished by the auditor of the company, approved by Messrs. Haskins & Sells, and after full consideration of the existing conditions, this committee at a meeting held on June 24th announced its willingness to co-operate and to accept on September 1st the merchandise creditors' plan upon condition, however, that at least $10,000,000 of subscriptions for new stock and all payments of matured installments thereunder be made and be in hand on September 1, 1908, and that certain of such subscriptions be satisfactorily guaranteed; that the assents of the holders of the bank debt to exchange their claims for the securities hereinafter mentioned be in hand by September 1, 1908, and that all the other conditions of the plan be complied with. The conditions also include the election and provision for the continuance of a board of directors satisfactory to the readjustment committee, either by proxy committee or otherwise, so as to insure a conservative management of the future financial and business affairs of the company."

They ask the bank creditors to sign agreements to accept for their claims:

Either (a) 50 per cent. in convertible bonds at par; 20 per cent. in assenting stock at par; and 30 per cent. in four, five, and six-year notes.

Or (b), 50 per cent. in convertible bonds at par, and 50 per cent. in 15-year notes.

"This committee, in recommending the acceptance by the holders of the bank debt of the securities and obligations herein mentioned, believes that under prevailing conditions it is advisable for the creditors to be satisfied with the reduction of the existing debt proposed under the merchandise creditors' plan, and with an increase of $6,000,000 in the cash working capital. It is represented by the above committees that the plan, if carried into effect, will terminate the receivership and restore the management of the business to the company. This result would obviate the possible necessity of a sale, with the consequent impairment of the company's good will and organization, and resulting loss to creditors."

"It should be added, as has been stated to the other committees, that unless the merchandise creditors' plan and all of its terms and conditions, and the additional conditions above set forth, are complied with by September 1st this committee must proceed with a readjustment or reorganization of the company, which, if necessary, will include a judicial sale of the entire assets and property."

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION

The eighth annual convention of the National Electrical Contractors' Association, held in Chicago on July 15th, 16th and 17th, opened on Wednesday morning with a meeting of the members and their guests in the convention hall, sixth floor, Auditorium Hotel. A large number of out-of-town contractors were present, and many invited guests representing other fields of electrical activity attended.

President Henry Newgard of the Illinois Electrical Contractors' Association in a speech of welcome to the contractors and their visitors reviewed the history of the association and mentioned its affiliation with many of the other national organizations. He spoke of the advantages of an association of electrical interests.

"The Electrical Contractors' Opportunities in the Illuminating Field" were discussed and some new lines of effort pointed out by Mr. George Loring, chief engineer of the National Electric Lamp Association. Mr. Loring called attention to the use of small electric-light units in places where no lights are now used. He suggested that contractors make a campaign for the installation of such small lamps as the 14-watt, 3-candlepower unit in dwellings, for part or all-night burning in porches, halls, etc. Considering that the cost of operating such a lamp is about one-seventh of a cent per hour, with power at the common rate of 10 cents per kilowatt-hour, attention was directed to the cheapness of this convenience and the protection afforded as arguments to be presented to the householder. The installation of such small units presents the three-fold advantage of the convenience to the customer, the more distributed load for the central station and the profit of construction to the contractor.

Mr. Loring gave other examples of dwelling, flat and store lighting, and by the aid of photometric distribution curves showed the effect of the height of the light and the position of the reflector on the surface to be illuminated. The talk was followed by some interesting questions from the members.

Mr. W. H. Merrill, Jr., of the Underwriters' Laboratories, Chicago, taking for his subject, "The Relations Between the Underwriters and the Contractors," spoke of the accord of spirit which exists between the interests he represents and the contractors. He pointed out that the public should be taught that cheap work goes hand in hand with dangerous work and that all work should be done by responsible persons, with the National Electrical Code specified in the contract. He closed with an invitation to the contractors to visit the laboratories at 382 East Ohio Street.

Mr. Merrill was called upon to answer some good-natured objections raised by several members relating to points where the contractors felt the rulings and administration of the inspection department could be slightly unfair. Mr. Merrill explained some points and admitted others, all to the satisfaction of his hearers.

Following luncheon, at which the contractors were the guests of the Electric Club of Chicago, Wednesday afternoon was devoted to a closed session. In the evening there were banquets for the ladies and gentlemen, followed by a vaudeville entertainment.

The remainder of the report of the convention will be given next week.

TUNGSTEN IN NEVADA

Tungsten deposits in White Pine County, Nev., are described by F. B. Weeks, of the United States Geological Survey, in a brief report forming part of an advance chapter of the Survey's Bulletin 340, which is entitled "Contributions to Economic Geology, 1907, Part I."

Tungsten, one of the rare-earth minerals, is now extensively used, as is well known, in the manufacture of incandescent lamps. The deposits examined by Mr. Weeks are on the west slope of the Snake Range, south of Wheeler Peak, about 45 miles from Ely, the nearest railroad station. The tungsten-bearing minerals found here are hübnerite and scheelite. The vein material is hard and is difficult to mine, and varies so greatly in amount and character within a few feet that the value of the deposits cannot easily be estimated. Considerable development work has already been done on the deposits, and means are at hand for further exploration, for waterpower is available for the generation of electricity for drilling and milling, timber can be had for mine timbers and fuel, and adjacent ranches would furnish all needed general supplies.

INDEPENDENT TELEPHONE AGITATION

Richmond, Ind., has stirred up excitement among Independent telephone men by the recently reported consolidation of the Bell concern, the Central Union Telephone Company, and the Richmond Home Telephone Company, the Independent corporation. It seems that the latter company has not been bought up by the Bell interests, as reported, but has leased to them some underground conduit space for which it secures added toll-line facilities. This contract was made between the two companies during the absence of A. C. Lindemuth, president of the Richmond Home Telephone Company and of the International Independent Telephone Association. Mr. Lindemuth did not hear of the negotiation till he saw it reported in the newspapers. To show his innocence of the transaction, which he had consistently opposed, he has resigned from the presidency of both the association and his company. The resignations have been accepted. He will be retained as counsel of the Independent Telephone Association and will continue to look after its litigation and conduct its fight against the Bell interests.

When interviewed concerning the action in Richmond, Mr. Lindemuth explained that an expensive system of underground conduits had been installed by the Home company much beyond its immediate needs purposely to shut out the Bell competitor. When the latter was compelled by a City Council order to bury its wires, it realized the advantage that the Independent company had from priority in this line and entered into negotiations to use some of the ducts. This the board of directors secretly granted against his wish, Mr. Lindemuth says. This board was composed of bankers and capitalists, more concerned with making a good business bargain than with Independent telephone principles.

On July 8th the executive committee of the Independent Telephone Association met at Chicago, accepted Mr. Lindemuth's resignation of the presidency and voted continued support in the legal warfare against combinations of any kind between Independent and Bell companies. A large sum of money was subscribed on the spot to carry on this work, Mr. Lindemuth heading the list of contributors.

ELECTRIC CLUB HAS CIVIC COMMITTEE

At the meeting of the Electric Club of Chicago held on July 1st the principal topic considered was a continuation of the discussion begun at the meeting of June 10th in favor of enlarging the influence of the club in civic and quasi-public affairs. The outcome of this discussion was the appointment of a civic committee in accordance with the following resolutions:

Resolved, That it is the opinion of this club that it should interest itself in quasi-public electrical questions, such as the proper illumination of the city from a commercial as well as engineering viewpoint, and offer the assistance of the club to those having such questions in charge.

Resolved, That it is the opinion of this club that we should co-operate with other clubs and organizations in concerted action in the agitation of questions and adopting measures necessary to further the cause of increasing the commercial use and application of electricity.

This civic committee as appointed consists of F. J. Postel, chairman, W. B. Jackson, S. Gardner, W. R. Bonham, F. P. Vose, H. A. Robinson, J. G. Pomeroy and C. A. S. Howlett. These gentlemen will get together directly and consider a number of electrical subjects of importance to the city of Chicago.

BUDAPEST TELEPHONE NEWSPAPER

The "telephone journal," a system which was originated some time ago at Budapest for telephoning the news from a central office to the subscribers, is working with considerable success, and has 200 employes in the winter season. There are about 500 miles of wire used for the subscribers' lines in the city. At last accounts there were more than 15,000 subscribers. The rates are very low, being only two cents a day. The news is sent to the subscribers in a determined order, starting from 9 a. m. and lasting until 8:45 p. m. Between the news items are sent advertisements as well as sermons, concerts, etc.

CORN PRODUCTS PLANT

[*Continued from page 43.*]

carried forward and discharged to a standard boiler-house crusher, operated by a 30-horsepower motor, by which mine-run size is reduced to 1½-inch-maximum cubes.

The hopper that receives the crushed coal is connected by a chute to a continuous bucket elevator which raises the coal and transfers it to a flight conveyor extending through the boiler house over bunkers. It is then delivered by the conveyor through gates placed in the trough to such bunkers as it may be desired to fill.

When handling mine-run coal the capacity of the installation is governed by the maximum capacity of the crusher, which is from 40 to 50 tons an hour. When handling fine coal, not requiring crushing, the capacity is controlled by the elevator, namely, from 50 to 60 tons per hour. The system is electrically driven throughout with controlling mechanism, located inside the boiler house. It was installed by the Link Belt Company of Chicago.

In an installation of this kind with the coal hoppers above the boilers and feeding the coal through chutes to the stoker, difficulty is always experienced in opening or closing the gates controlling the supply of coal, as they are very apt to wedge or become stuck in some way. To prevent this and get a straight pull or push on the gate, a bell crank and screw arrangement was provided. The screw has only five threads to the inch, so that a few turns of the wheel will open or close the gate.

Another feature of interest is the poke rod. This is provided with a ball which will close the opening through which it passes and at the same time allow a thrust in any direction to start the coal if it happens to become lodged at the mouth of the hopper.

BUILDINGS.

The power house, corn-storage tanks and manufacturing buildings are of fireproof construction, and the warehouses are of mill construction. All buildings are so arranged as to have excellent light and ventilation, and the floors of the fireproof buildings are arranged to be flushed with water at the close of each day so as to have them at all times in a state of cleanliness and perfect sanitary condition. A complete sprinkler system is installed, and with a 50,000-gallon water tower in connection with the two fire pumps a pressure of 200 pounds is maintained all over the grounds.

CAPACITY.

This plant, which was planned and constructed under the supervision of its superintendent, Mr. P. L. Saenger, assisted by Messrs. G. C. Welch, S. H. Lanyon and J. J. Waechter, is designed to handle 30,000 bushels of corn daily, the machinery for one-half of which has already been installed. In completeness and economical operation it leaves practically nothing to be desired.

ILLINOIS CENTRAL MAY BE ELECTRIFIED—PERHAPS

The Illinois Central Railroad held out the inducement of a possible early electrification of its suburban service to the Chicago City Council a few days ago when it requested that body to grant permission to the Kensington and Eastern Railroad to cross 15 streets in the extreme southeastern part of Chicago. The latter road is to be an electric interurban line running from the Illinois Central main line at Kensington to the new steel works at Gary, Ind. The Illinois Central proposes to lease or purchase the new line and operate it as a part of its own system. Practically all the right-of-way has been secured, and the right to cross these outlying streets alone is needed to carry the project through. The officials declared that electrification of the Illinois Central suburban service might result if this was granted.

It is believed that a larger project is back of the Kensington and Eastern road. The Chicago, Lake Shore and South Bend Railway has been rapidly pushing its interurban road westward from South Bend and Michigan City, Ind., which have already been joined, to Gary and Hammond. This road has made arrangements with the Illinois Central to carry its cars over that line from Kensington to Randolph Street, Chicago. Thus the Kensington and Eastern seems to be only a connecting link between a large interurban system in Indiana and an excellent Chicago terminal. It would be economy to carry these electric cars by their own electric power, and if this were done the electrification of the Illinois Central suburban service would undoubtedly follow.

WESTERN ELECTRIC COMPANY TO CONCENTRATE ITS MANUFACTURING AT HAWTHORNE

It is officially announced that the Western Electric Company of Chicago will soon abandon its old Clinton Street works as well as those at Polk Street and the river and concentrate all its manufacturing departments in Chicago at the Hawthorne Works, which will be much enlarged to accommodate them. About $600,000 will be spent in the construction of three large buildings and in additions to some of the buildings already erected. Some of the departments at the New York plant will also be moved to Hawthorne.

This important action was taken as the result of careful consideration of the immediate opportunities and future needs of the company. It was believed that the present conditions of diminished activity, inasmuch as they did not tax the manufacturing facilities now at hand, were peculiarly favorable for a rearrangement, that would be soon needed, of the manufacturing work now carried on at the old plants. By concentrating all the work at the as yet only partly developed Hawthorne Works, there would be realized material advantages in economy of production and opportunities for more systematically arranged future additions.

The new additions to the Hawthorne Works will make it one of the largest manufactuing plants in the country. With a ground area of 150 acres and most excellent railroad facilities for the receipt of raw material and fuel and for the shipment of finished products, these works combine the most modern machinery and methods of manufacturing on a large and economical scale. A short description and general view of these works, as now constituted, was given in the Western Electrician of May 30th last, p. 444. The principal additions required will be for the telephone department that now occupies most of the old Clinton Street works.

At these old works the company began its manufacturing career on a small scale over 25 years ago. Steady growth of the business brought the expansion of the establishment so that it now occupies practically all of the two blocks bounded by Clinton, Jefferson, Van Buren and Harrison streets. The ground area is about 200,000 square feet, while the combined floor area of the different buildings is close to 900,000 square feet. The plant at Polk Street and the river has a ground area of about 210,000 square feet, with good shipping facilities by both rail and water. The value of these two plants is placed at more than $3,000,000. They have been placed on the market to be sold or leased.

As is well known, the works at Hawthorne are on the western boundary of the city of Chicago. The main office of the works is at Twenty-fourth Street and Forty-eighth Avenue.

THAT "WIRELESS" FRAUD ORDER

Writing under date of July 8th, the San Francisco correspondent of the Western Electrician says: "An interesting situation has developed here regarding the recent fraud order from Washington, D. C., forbidding the use of the mails to the Oakland Transcontinental Aerial Telephone and Power Company. Since a case has gone to trial in the courts it has been shown that the action was too hasty, at least in its application to Jahnke, the wireless-telephone inventor. The indictments against J. B. Allen, Dr. Bardach and M. F. Allen of the company named, who were charged with using the mails for a scheme to defraud, were dismissed on July 6th. The hearing of Prof. Albert Jahnke, the inventor of the wireless telephone advertised by the company, and Wade Hampton Shadburne was continued the next day, following a motion to dismiss.

"Frank Carmody, an electrician of 15 years' experience, now employed in the mint, testified that he had attended a demonstration of Professor Jahnke's wireless telephone in Kansas City, Mo., in 1904, and communicated articulate speech without the aid of wires from Kansas City to a place seven miles away. Carmody said that Jahnke had the right principle, and that if a person could talk one mile he could communicate for a distance of a thousand miles if the instrument were strong enough. The defense also proved that Jahnke had expended $10,000 of his own money in perfecting his invention, and that he had received but $600 from the Oakland company for his services."

QUESTIONS AND ANSWERS

STANDARD TRACK GAUGE

W. B. P., Pittsburg, Pa.: What is the standard gauge for street-railway tracks? How is it measured? What is the gauge of the electric roads connecting Cleveland and Youngstown, Ohio, with New Castle, Pa.?

ANSWER.

The standard gauge for practically all street-railway tracks in this country is the same as the standard gauge for steam-railroad tracks, which is 4 feet 8½ inches in this country, in England and on the Continent of Europe. The gauge of a track is measured between the rail heads. If the sides are sloping the measurement is taken from a point at half the depth of the head. Where grooved rails are used the gauge is the distance between the intersections of the tangents to the outside grooves and the tops of the rails.

Since only by means of a standard track gauge can the interchange of rolling stock between different railways be accomplished, the adoption of the standard 4-foot 8½-inch gauge on street and interurban railways has been very general throughout this country and particularly in Ohio, Indiana and Illinois. The electric lines between Cleveland, Youngstown and New Castle referred to above have the standard-gauge tracks.

ARC LAMPS ON SERIES CIRCUITS

J. V., Chicago: What is the voltage on the lamps and how many are put on a circuit in the new street arc-lighting circuits now being put in by the city of Chicago, such as along Archer and Ashland avenues?

ANSWER.

All new street-lighting circuits of the city of Chicago, such as those referred to, are being equipped with alternating-current arc lamps to simplify the transformation from the source of power at the Sanitary District's Lockport plant. The lamps are connected on series circuits with regulators. There are 50 lamps on a circuit, each taking about 80 volts. A description of the new street lighting in Chicago was given in the Western Electrician of April 4th last.

STORAGE BATTERIES FOR LIGHTING

A. K., Joplin, Mo.: I have a storage battery for an automobile engine igniter. Why can I not use it to light ordinary 16-candlepower lamps?

ANSWER.

The voltage of a single storage cell is close to two volts during discharge, no matter what is the size of the cell. An ordinary 16-candlepower lamp requires 110 volts at its terminals to light it up brightly. A storage battery can be used for this purpose by connecting up in series about 55 individual cells. For ignition purposes two or three cells are usually put in series in a single box; these give only four or six volts, respectively. If one wishes to light incandescent lamps from such a battery, four or six-volt lamps must be used.

AN ELECTROMETALLURGICAL SUBSTITUTE FOR PLATINUM

As a substitute for platinum in acid-resisting vessels, Adolphe Jouve, in a paper before the Faraday Society in London, suggests the use of high-percentage silicon alloys, which can be easily made in the electric furnace. The author has applied some of these alloys, styled by him "métillures," of which, however, the composition is not given, to the manufacture of acid-resisting vessels, and a great variety of these, some of considerable size and weight, have been successfully used for the treatment or passage of nitric, hydrochloric and sulphuric acids, cyanides, sulpho-cyanide, prussic acid and other corrosive reagents.

CHARACTERISTICS OF ELECTRIC MOTORS

At the recent convention of the Iowa Electrical Association in Des Moines Prof. A. H. Ford of the State University of Iowa read a paper in which he presented some of the standard characteristics of electric motors supplemented by data obtained by him in the laboratory at the university. Professor Ford said that when an electric-power-station manager decides to make a campaign to increase the load factor of his station, one of the most promising fields is in the acquirement of a motor load. There are few power stations which have not within their territory a greater or less number of small, or even large, manufacturing plants which could be motor-driven at a profit both to the owner of the electric power station and the owner of the manufacturing plant.

Before a person can successfully solicit for this kind of business it is necessary that he should know the characteristics of the different motors which are on the market and how they are applied to the various machines. With this fact in mind Professor Ford wrote his paper with the idea of giving in a convenient and condensed form the characteristics of the various motors which are at present on the market. The paper, almost entire, is given below.

Direct-current Motors.

Shunt Motors.—The most widely used motor is probably the shunt motor, as it possesses characteristics which allow of its convenient adaptation to a larger variety of drives than any other motor. The shunt motor running on a constant-potential circuit is essentially a constant-speed machine, though its speed may vary somewhat with the load. In general, the speed will decrease as the load increases, but this change in speed is not more than about five per cent., even in a motor of as small capacity as two horsepower.

Where it is desirable to adjust the speed of a motor of this kind, it can be done by inserting a resistance in series with the armature if the speed is to be decreased below the normal speed of the machine. This method of speed adjustment has two defects: In the first place, the speed is no longer nearly constant as the load changes, but varies inversely as the load, this variation being greater the greater the resistance placed in series with the motor, that is, the greater the reduction of the speed desired at a given load. In the second place, the regulating resistance causes a large loss of energy and therefore is uneconomical.

The speed of a shunt motor may be increased above the normal by the insertion of a resistance in series with the field. This has the effect of reducing the field excitation, with the result that the armature must run faster to generate the same counter-electromotive force. Motors, as built at present, allow of an increase in their speed of from 25 to 50 per cent. without sparking. When designed especially for this class of service their speed may be increased as much as 300 per cent., and when interpolar motors are used the speed may be increased as much as 500 per cent. When the speed is regulated by this method it does not change much more with load than it does when there is no external resistance in series with the field. The efficiency of the machine is practically the same at all speeds, for the decreased field loss at the high speeds is balanced to a certain extent by an increase in the armature core loss.

A comparison of the foregoing methods of speed adjustment is decidedly in favor of the second method in most cases; for, in addition to the poor regulation when the speed is varied by means of armature resistance, this method requires that conductors large enough to carry the armature current be carried to the regulating rheostat, which means that these conductors will be large for a large machine, with a consequent limitation to the location of this rheostat; which is of necessity rather bulky. The field regulating rheostat, on the contrary, is small, therefore may be located in the most convenient place for the operator of the machine. The starting torque of a machine with field regulation varies directly with the current, so that there is no trouble about getting a starting torque equal to, and even greater than, full-load running torque of the machine; providing that the starting current with load is allowed to be greater than the full-load current.

Series Motors.—The series motor is essentially a variable-speed motor, the speed varying inversely with the load of the machine. This variation is so great that a series motor will run at such a high speed as to throw itself to pieces, if allowed to run light. Therefore, a series motor should always be connected to the machine it is to drive by means of a rigid coupling or gears; and it should never be attempted to drive a machine which will have its load reduced to a very small amount unless there is an operator present at the starting rheostat all the time, so that he can reduce the current supplied to the motor in case its speed gets too high. The series motor has an advantage over the shunt motor in that its starting torque varies approximately as the square of the current, and therefore it is a very desirable motor to use when a large starting torque is desired, or when the speed of the machine is to decrease as the load increases. Series motors are used almost exclusively for railway work and on hoists and traveling cranes.

Compound Motors.—It is frequently desirable to combine the large starting torque of a series motor with the constant speed of a shunt motor, which is accomplished by using a compound motor with shunt and series fields acting together, giving the series field from one-fourth to one-half of the ampere turns at full load which the shunt fields have. A motor with this style of winding will have a large starting torque and also a large variation of speed with output, but will not increase its speed with the reduced load beyond a safe maximum. Compound motors are used very largely for elevator service, in which case the controller is usually constructed so as to cut out a portion or all of the series field as soon as the car has attained sufficient speed. They are also very largely used for the driving of flat-bed printing presses, so as to reduce the fluctuations in the current consumed by the motor.

When it is required to have a speed which stays constant as the load changes, or which increases as the load increases, it is necessary to use a compound motor in which the series and shunt fields act in opposition. When connected in this way a machine has a small starting torque, much smaller than it would have as a shunt machine, and therefore it is customary to arrange the starting rheostat so that the series field is not in circuit until the machine is up to speed. Such machines are seldom used, as a sufficiently close-speed regulation can be obtained by the use of a shunt motor.

Alternating-current Motors.

Synchronous Motors.—The synchronous motor is the simplest alternating-current motor we can have from the standpoint of construction, and therefore it should be the cheapest. It, however, has disadvantages which prevent its use for general power purposes.

The speed regulation is perfect—that is, it runs at the same frequency as the generator, so that if the frequency of the current supplying the machine is constant it will run at a constant speed. These motors may be either single-phase or polyphase, but are practically always polyphase, and are used only where large amounts of power are required and when the motor runs practically continuously.

Single-phase motors of this type are not self-starting, but require the use of some auxiliary starting device to bring them up to speed when they are synchronized and thrown on the circuit. Polyphase motors are self-starting but have a very small starting torque and must therefore be started light. They are started by throwing them across the line in series with an impedance or else connecting them to the low-potential taps of auto-transformers; the latter of these methods being preferred, as it draws less current from the line and so interferes less with the line regulation. Where line regulation is at all important it is necessary that these motors be brought up to speed by an auxiliary motor and synchronized the same as one would synchronize a generator when connected to the bus-bars.

Induction Motors.—The induction motor, either single-phase or polyphase, is essentially a constant-speed motor. The speed decreases as the load increases, this decrease being very slight at first and then increasing more rapidly until the maximum load which the machine will carry is reached, when the speed suddenly drops to zero. It is best to adjust the speed of an induction motor by inserting a resistance in its rotor circuit, in which case the machine has practically the same kind of speed characteristic as a shunt motor with a resistance in its armature circuit. It is possible to build induction motors with very small regulation, much smaller than shunt motors have, the regulation being in some cases less than one per cent., even for motors of moderate size.

Single-phase induction motors require an auxiliary device for starting, and even then usually have such a low starting torque that they can only be started at a very small load. This starting device can be made automatic, so that for small motors all that is necessary to do to start the motor is to close the main switch. Polyphase induction motors have a small starting torque unless they are provided with a resistance in the rotor circuit, in which case the starting torque can be made several times the running torque; when without starting resistance in the rotor circuit they can be started by merely closing the line switch. This takes too large a current from the line to be used except for small machines, and therefore motors without starting resistance are usually started by connecting them to the low-potential taps of auto-transformers. The starting may then be accomplished by means of a double-throw switch; one position cutting in the auto-transformers and the other cutting out the transformers and connecting the motor directly to the line. Rotor resistance when used for starting service only are usually mounted in the rotor itself and operated by means of a lever connected to a collar on the shaft, or, in small sizes, by means of a knob projecting from the end of the shaft.

Single-phase motors weigh more for the same output and therefore cost more than polyphase motors, but the saving due to the possible use of only one transformer in place of two or more, more than compensates for this extra cost; so single-phase motors are used for sizes smaller than five-kilowatt, and in many cases for larger sizes than this, in preference to polyphase motors.

Series Motors.—The series alternating-current motor has practically the same characteristic as a series direct-current motor and is used for the same class of service. It has, however, various defects, and so is not used where a direct-current is available. The important defects are low power factor and liability to spark. The liability to spark is very much reduced in modern machines of this class, but still it is very much greater than in a similar machine for use on direct-current circuits.

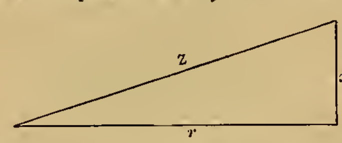
Repulsion Motors.—The repulsion motor has the same characteristics and defects as the series motor and is consequently not used for general power purposes. It is, however, used as a starting device for single-phase induction motors. This is due to the fact that after it is started the machine can easily be converted into an induction motor by merely short-circuiting the commutator bars. The brushes are usually lifted from the commutator bars at the same time, both of these being accomplished automatically. The single-phase motor with this type of starting device has a large starting torque and takes a small current from the line during starting if provided with a starting rheostat similar to that used for starting direct-current motors.

ALTERNATING-CURRENT PROBLEMS

At the Atlantic City convention of the American Institute of Electrical Engineers on July 2d a paper written by Harold Pender of New York was presented in abstract. It bore the title "Minimum-work Method for the Solution of Alternating-current Problems."

The object of the paper was to give a method for making the numerical calculations of the usual problems that arise in alternating-current practice with the least amount of effort. The method is trigonometric in principle and has nothing to do with the mechanical principle of minimum-work. The author did not realize that this misconception might arise until after the paper was published; a better title would probably be: "A Trigonometric Method for the Solution of Alternating-current Problems."

The fundamental idea involved in the method is the use of certain factors, namely, the ratio of the reactance to the resistance, the "reactance factor" t, and the ratio of the resistance to the impedance, the "power factor" k, instead of employing the reactance and impedance directly. From the triangle



giving the relation between resistance, reactance and impedance it is evident that the reactance factor $t\left(=\frac{x}{r}\right)$ and the power factor $k\left(=\frac{z}{r}\right)$ are the tangent and cosine, respectively, of the same angle. If either of the two quantities t or k is known, the other can then be taken directly from a table of cosines and tangents. A table giving the values of t (tangent) in terms of k (cosine) is arranged in a form more convenient than the usual trigonometric tables. Of the two factors, k is the more readily determined from actual measurements, since

$$k = \frac{W}{EI}$$

t can be taken from the table. If the reactance x and resistance r of the circuit are known, t can be readily calculated, since $t = \frac{x}{r}$, k can then be taken from the table.

In the paper are given the solutions of a number of alternating-current problems by this new method.

A comparison of the formulas deduced with those ordinarily used will make evident at once, the author thinks, the simplicity of this method, especially for numerical calculations.

In the appendix to the paper is given a table, found extremely useful by the author, for quickly determining the size of wire required for any case of transmission.

SELF-RESTORING INSULATORS

By Albert Scheible.

While it has been customary to judge insulators for high-voltage circuits chiefly by the voltage at which they maintain a continuous arc, or at which they break down, this in itself may not always form a fair basis of comparison between different styles and makes. Conditions will sometimes arise in practice which will impose an abnormal voltage on an insulator for a brief period of time, and while this abnormal voltage may momentarily annul the insulation, the latter need not necessarily be broken down. Under such conditions preference should certainly be given to the design and make of insulator which will most readily resume its high insulation after the abnormal strain is removed, either by a cessation of the momentarily excessive voltage, or by an increase in effective insulation, due to some change in the insulator itself.

The latter fact was only recently mentioned by Mr. C. J. Greene in his report on the tests of various designs and makes of European and American high-voltage insulators. (London Electrical Review of April 14, 1908.) Among these tests were some on an insulator of the mushroom type, which, in a clean and dry condition, sparked at 80,000 volts and broke down at 90,000 volts. After being wet all over, the same insulator sparked at 45,000 volts, but the heat of the arc soon dried the insulator, thereby causing the arc to cease. A higher voltage restored the arc, but it was again extinguished by the further drying of the insulator. This restoring and ceasing of the arc was repeated with each increase of voltage until a permanent arc was established at 90,000 volts, the insulator then being presumably quite dry. Continuing this line of experimentation, the same insulator was then tested under conditions imitating those in proximity to railways or collieries, by first coating the entire surface (excepting the interior of the inner sleeve) with a mixture of coal dust and water. When thus coated the first spark started at about 50,000 volts, but the insulator soon began to dry, and the discharge from it carried off enough of the coal dust so as partially to clean the surface and thus stop the arc. Gradual increases of voltage showed a repetition of this drying and cleaning process, until the arc became permanent at 85,000 volts (or about 5,000 volts less than when the same insulator was entirely free from the coal dust). It will be noted that this self-cleaning of the insulator, like the partial drying in the previous instances, occurred at voltages which are still rare even in this country, it being doubtful whether at lower voltages the action would be rapid enough to be effective. However, this interesting phenomenon may partly account for the unexpectedly long life which such insulators have shown under trying conditions, and it may also form a new basis of comparison for judging insulators of various designs and materials.

Some years ago the writer had occasion to note another phase of the self-restoring of insulators, which has since found practical application, though unknown to a large share of the users. In designing some arc-lamp insulators for use on high-voltage circuits, the requirements aside from high insulation were mechanical strength and an interlocking of parts to prevent a possible dropping of the lamp, in case the body of the insulator was damaged by a blow or by lightning. Careful study led to a form of insulator having a petticoated porcelain bell for its body and specially designed metal fittings connected thereto. With this arrangement of parts, a space between some of the metal fittings in the interior of the device had to be filled with some mixture which could be introduced in a plastic state, and which would not puncture at too low a voltage. Considerable experimenting as to suitable mixtures for this purpose led to the adoption of one having so high an insulation that the arc would form over the petticoats on the outer porcelain bell before it would puncture the inner compound. Then a further increase of the voltage while the discharge was passing over the outer surface would puncture the inner plastic insulation, thus practically breaking down the insulator. After allowing the device to cool, Professor Woodworth of Chicago, who was conducting the tests at the Lewis Institute, was surprised to find that the puncture break had automatically healed itself, so that a new breakdown test on the same insulator would require approximately the same, and, in some instances, even a higher voltage than that at which the original puncture had occurred.

The importance of such a self-restoring feature in arc-lamp insulators will readily be apparent, as it implies that no permanent damage would be done by the average static discharge during an electric storm. The fact that such a feature has already been introduced in arc-lamp insulators and insulating cross-arms, which have been widely used in this country, may account for some of the fine service obtained from them under severe conditions. Taken in connection with Mr. Greene's experiment, it also suggests that insulators for high-voltage work should no longer be judged merely by their ultimate breakdown voltages, but at least partly by the voltages from which they will readily recover, and the readiness with which they will recuperate if subjected to strains considerably below their puncture voltages.

MEASURED TELEPHONE SERVICE

In accordance with the new franchise under which the Chicago Telephone Company is now operating, the commissioner of public works, the chairman of the council finance committee and the corporation counsel of the city of Chicago are a committee to determine the practicability and accuracy of measured-service meters and are empowered to order installed at all such subscribers' stations any meter they find suitable. For some two weeks these officials have looked into the subject without as yet deciding on any particular type. Four types were submitted for comparison by the Measured Service Company, the Premier Electric Company, the Baird Manufacturing Company and the American Coin Register Company. Their merits were explained by representatives of the different competitors. The first company, which is backed by the American Electric Telephone Company, asserts that its patents are basic and that the others are infringements. Meanwhile the Chicago Telephone Company is perfecting a meter of its own make that it believes will be reliable.

MONTREAL WILL BUILD CONDUITS

The Quebec Legislature has empowered the city of Montreal to borrow $5,000,000 to construct conduits in which all electric wires shall be placed. It is planned that the city shall construct a system of conduits and operate the same, wherein shall be required to be placed all the telegraph, telephone, electric-light and other wires and cables belonging to any person or corporation, having privileges over the streets of the city.

The city is to have power to charge rental from those companies which occupy space in the conduits. If a company occupies one-tenth part of a conduit it shall pay one-tenth of the amount of the cost of maintenance, and the interest on the loan. The idea is that the city will, in time, recoup itself for the amount expended.

TELEPHONE IN VACANT HOUSE

A question has been raised by a citizen of Oshkosh, Wis., as to the propriety of the telephone company charging him for telephone service at his residence during the summer months, when he is at a summer cottage and therefore gets no use of it. The inquirer asked the State Railroad Commission for a ruling upon the point, but the commission will not hazard an offhand statement. The company offered to allow the instrument to remain in for half price during the summer, or to remove it and reinstall it in the fall, when it would be necessary for the subscriber to sign a contract for a year, as all new subscribers must do. Neither plan is acceptable to the complainant, and the question may come before the commission for adjustment.

COMMUNICATION

INVENTORS' ORGANIZATION

To the Editor of the Western Electrician:

A discussion having arisen in various parts of the country regarding the status of the inventor with relation to the United States Patent Office, and resulting in the opinion that inventors of the country should form a national organization for the protection and advancement of their interests, permit us to state that just such an organization exists in the International Congress of Inventors, established in 1906, incorporated in 1907, and having members in several states of the Union, with branches formed or forming in Texas, Missouri, Illinois and California.

This organization was established to benefit inventors as a class by seeking to secure legislation which shall insure to the inventor the services at the Patent Office which his application fees should provide, and the protection for his invention which a government guaranty should give.

Largely through the efforts of the International Congress of Inventors the Federal Congress has this year provided for an increased force of examiners in the Patent Office and for an advance in the salaries of the Patent Office employes, which will tend to retain in government employment those who have become expert in the treatment of applications. A patent fund of $7,000,000 has been accumulated from the sums paid to the government by inventors, and the Patent Office is the only self-sustaining federal department. Surely the inventors of the country are entitled to the consideration which these facts warrant.

An important matter under consideration by the International Congress of Inventors is the establishment of a standard for a United States patent. The patent system purports to be a method of rewarding inventors and thereby stimulating the production of inventions of value to the public. But patentees and holders of patents find that a United States patent, in order to attain a definite standing must be tried out in court. Yet a guaranty of protection issued by the government ought to be something more than a license for a lawsuit. The International Congress of Inventors is giving this matter careful consideration, and it will seek such action by the government as will make a patent conform to its purport. This is one of the many subjects now before this organization. Suggestions in the interests of inventors and all who hold patents are solicited by this organization.

Ralph T. Olcott,

Secretary International Congress of Inventors.

Rochester, N. Y., July 2, 1908.

TELEPHONE EXTENSIONS IN SASKATCHEWAN

The construction programme of the Department of Railways and Telephones of the government of the province of Saskatchewan, Canada, has been announced and tenders will be called at once for all the materials required for new telephone lines. Actual construction work will be commenced early in August, and it is hoped that a considerable mileage will be in operation before winter sets in. In order that work may be resumed as early in the spring as possible the government will secure all its supplies for the season of 1909 during the coming winter.

The long-distance telephone lines to be built by the government include the following:

From Lumsden to Prince Albert, connecting with the towns along the Canadian Northern Railroad.

A line to serve the towns along the Arcola and Estevan branches of the Canadian Pacific Railroad.

Branch lines east and west from Warman to the boundaries of the province and following the Canadian Northern Railroad.

Branch lines paralleling the Wolseley and Reston, Pheasant Hills, Weyburn and Stoughton branches of the Canadian Pacific and Canadian Northern railroads.

A line eastward from Prince Albert, connecting Kinistino, Melfort, Star City, Tisdale and other towns and villages.

A line crossing the province from north to south and connecting Alameda, Carlyle, Wapella, Yorkton and Saltcoats.

Branch lines will also be laid out to follow the railway branches into the Goose Lake, Shelburne and other districts including lines west from Weyburn and northwest from Moosejaw.

In all the province has mapped out some 600 miles of long-distance lines to be built at once, and when this is completed and the province better settled other lines will be built. A number of applications are being received at the department for assistance toward forming local and rural companies.

GENERAL ELECTRIC AUTOMATIC VOLTAGE REGULATORS

In order that a practically constant voltage be maintained at the lamps it is well to have the generator controlled by a potential regulator so as to maintain a constant voltage at the bus or substation independent of load changes. The various feeders branching out from the station may also be controlled by feeder regulators arranged so as to compensate automatically for the drop in that particular feeder due to varying loads.

By this system of voltage regulation a practically constant potential is maintained at the individual lamp, resulting in decrease of lamp renewals, production of uniform illumination, increased sale of energy to the customer, decrease in number of station attendants and increased capacity of feeders.

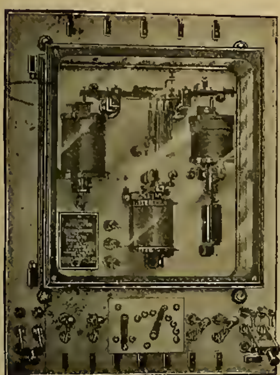


Fig. 1. Tirrill Voltage Regulator.

Fig. 2. Automatic "BR" Feeder Regulator.

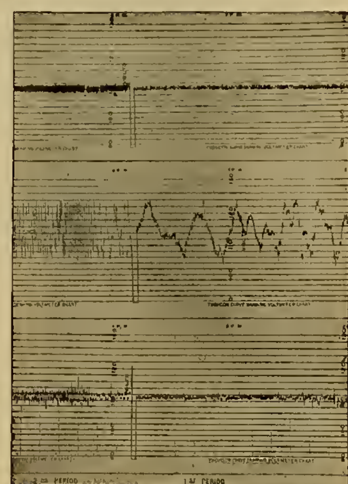


Fig. 3. Charts Showing Regulation of Feeder Voltage.

Fig. 4. Automatic "IRS" Feeder Regulator.

GENERAL ELECTRIC AUTOMATIC VOLTAGE REGULATORS.

It is possible to dispense with the regulator controlling the generator by supplying the individual feeders with regulators having a sufficient capacity not only to compensate for line drop, but also to compensate for the voltage variations in the generator. But it is advisable, says the General Electric Company, both on account of economy and operating conditions, to control the generators by a Tirrill regulator. This regulator, shown in Fig. 1, is a relay device mounted on the switchboard and is so adjusted that it controls the generator voltage by rapidly opening and closing a shunt circuit across the field rheostat of the exciter. The action of this regulator is rapid, and there is practically no fluctuation in the voltage. By its use the kilowatt capacity of each regulator for the individual feeders is reduced as well as the number and amount of their adjustments.

Two types of regulators, designated as the "BR" and "IR," are manufactured by the company named for automatically controlling the voltage of individual feeders. The feeder regulators of the above types are variable-ratio transformers or rather compensators, having two separate and distinct windings, primary and secondary, connected respectively across and in series with the feeder to be controlled. The product of the volts and amperes on the generator or bus-bar side is always equal to the product of the volts and amperes on the feeder side less the small loss in the regulator itself. Both types of regulators perform the same function, and the principal difference in the results is in the rapidity with which they operate.

The BR regulator, shown in Fig. 2, consists essentially of a transformer, the secondary of which is divided into a number of equal sections, and a dial switch, the points of which are connected to the sections of the secondary winding. In this type of regulator the moving element is exceedingly light, and, having but little inertia, is particularly adapted for very rapid adjustments. The total time required for obtaining the complete range from maximum boost to maximum lowering is about six seconds.

This regulator is built only for single-phase circuits and in comparatively small units, since the capacity is limited by the current and voltage which can be conveniently handled by the switch. The capacity of the standard switch is 200 amperes and 220 volts boost and lowering. As this, however, represents a 20 per cent. range on a 2,200-volt, 440-kilowatt circuit, and it is seldom found advisable to run a single feeder of so large a capacity, the standard BR regulator will be found suitable for the majority of conditions.

The induction or IR regulator, shown in Fig. 4, is more rigid and substantial in construction, and has a less number of moving parts than the switch type and no moving contacts. The efficiency is somewhat higher, but it is slower in operation than the BR regulator, as the armature or movable core on which the primary is wound has not only considerable inertia but also a torque depending on the kilowatt capacity, both of which must be overcome by the operating motor. The secondary or series winding is arranged in slots on the inside circumference of the stationary core, and the variation in the feeder voltage produced by the regulator is entirely due to the change in the angular position of the two cores.

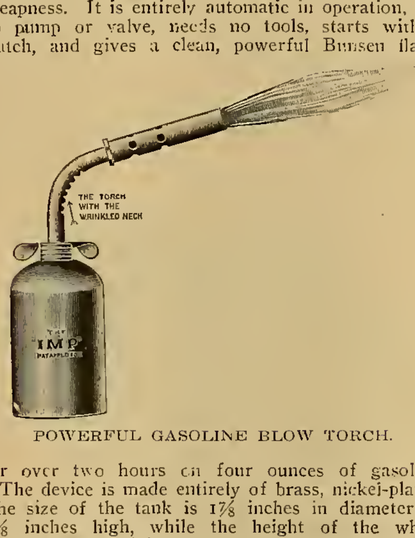
Induction regulators can be furnished for operation on single or polyphase circuits and are designated by the type letters IRS for the single-phase, IRQ for the quarter-phase, IRT for the three-phase and IRH for the six-phase designs. Although used principally for the control of lighting circuits, induction regulators are equally well adapted to power circuits, on which they have been used principally in connection with polyphase rotary converters.

The three curves shown in Fig. 3 were taken simultaneously and show the comparative regulation of voltage by General Electric type BR and IR feeder regulators. The middle curve represents the generator voltage, while the upper curve was taken from a feeder controlled by a BR regulator, and the lower curve represents the voltage on a feeder controlled by a regulator of the IR type.

It will be noted that as long as the variations in the generator are gradual, such as occur on the ordinary lighting circuit, either type of regulator will produce a fairly uniform voltage, but with abrupt changes in the generator voltage, such as are produced by a railway load, or in the starting of large induction motors, the switch type is the more satisfactory one.

POWERFUL GASOLINE BLOW TORCH

The "Imp" torch, shown in the accompanying cut, is a patented device, which, the manufacturer says, will do as much work as most of the larger torches, with the advantage of compactness, simplicity and cheapness. It is entirely automatic in operation, has no pump or valve, needs no tools, starts with a match, and gives a clean, powerful Bunsen flame for over two hours on four ounces of gasoline.



POWERFUL GASOLINE BLOW TORCH.

The device is made entirely of brass, nickel-plated. The size of the tank is 1⅞ inches in diameter by 3⅛ inches high, while the height of the whole torch is only 6¾ inches. The corrugated neck increases the heating surface to such an extent that the flame of a match easily generates gas enough for starting, after which the well-designed mixing tube renders further attention unnecessary. This torch is made by the Frank Mossberg Company of Attleboro, Mass.

RECENT IMPROVEMENTS IN SERVICE SWITCHES AND BRANCH BOXES

There has developed within the last few years a large demand for weatherproof service switches, and such switches have been extensively used, with the result that severe conditions have indicated ways in which they could be improved. One of the weaknesses of the old-style switch was that the neutral fuse was removed when the switch was opened, which sometimes resulted in accidents, owing to the fact that the removal of the fuse opened the ground connection of the neutral wire. Another point was that while the old-style box was intended as a weatherproof box, not being provided with gaskets it frequently fell far short of meeting this requirement.

A new line of D. & W. switches and boxes has been developed in which these defects have been corrected.

IMPROVED BRANCH BOX WITH LOWERED COVER.

The devices are constructed for use both as cut-out and switch, and are intended to be placed on the outside of buildings where overhead wires enter, or in cellars where the wires enter from the subway. The accompanying illustration shows how the service switches are so designed that the neutral fuse remains permanently in the box, thus avoiding any possibility of accidents, due to the fuse being improperly withdrawn. Withdrawal hooks are provided on the positive and negative only. This avoids possibility of tampering with the box through ignorance or otherwise and so leaving the box that in case of fire the neutral fuse is drawn, leaving the other fuses in the box.

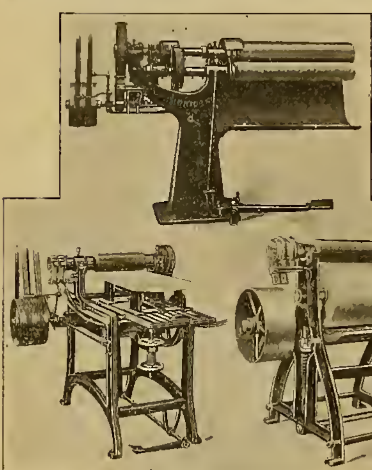
Fuse guides are mounted in the covers to align the fuses accurately, so that positive contact is made when the cover is again closed, throwing the fuses into circuit. There are also mounted in the covers withdrawal hooks, which, by one-quarter turn of the levers on the outside of the cover, remove the positive or negative fuse at will, and when desired the cover can also be opened without removing any of the fuses.

The fuses are of the well-known D. & W. National Electrical Code standard, and the boxes are provided with rubber gaskets and removable porcelain bushings, thus making them moisture-proof when the cables are taped in. The outlets of the box are amply large, so that after the bushing is removed the cable terminals may be passed through the box and sweated on to the cable, which is desirable during installation. Branch boxes and main-line boxes are manufactured in double-pole and triple-pole types and in sizes carrying from 30 to 400 amperes. Branch boxes have split bushings mounted in the covers and boxes, which permit of the necessary connections without any break in the wiring, thereby reducing the cost of installation. This line of improved cut-out boxes is placed on the market by the Central Electric Company, Chicago.

ELECTRIC HEAT IN THE LAUNDRY

Electric heat is particularly applicable to the needs of public laundries and to the laundries of hotels, public institutions, ocean liners, etc., where the power is generated on the premises. The advantages of electrically heated hand-irons and machine rolls or blocks in the laundry are numerous. The condensation and other transmission losses of steam are eliminated, gas or coal-heating devices are done away with, and energy consumed only during the time devoted to useful work. When the laundry is installed in a hotel, hospital, asylum or on warships or ocean liners, the use of electric heat presents the advantage of supplying a day load in addition to the regular demand for light and power. In such plants the use of electric heating devices in the laundry simply adds a slight additional load during a portion of the time when the load on the generators is lightest.

In the large commercial laundries, which operate their own steam plant and generate electricity for light and power purposes, it has been found advan-



Body Ironer.
Bosom Ironer. Collar and Cuff Ironer.
LAUNDRY MACHINES WITH ELECTRICALLY HEATED ROLLS.

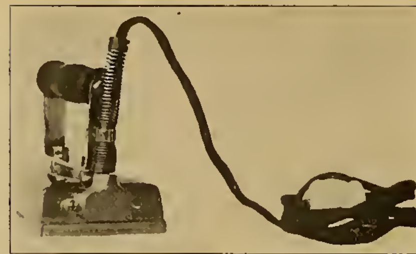
tageous to use electric heat for the high-temperature work on the small machines and steam where large quantities of heat are required at lower temperatures. In such laundries the electric drive is largely used for operating the machines, and the use of electric heat entails but a very slight addition to the expense for wiring, and does not increase the labor of generating the power. It may, however, be necessary to install slightly larger dynamos.

An advantage of electrically heated rolls and one which increases the capacity and reduces the maintenance cost of the machine padding, is the fact that the heat is uniformly distributed over the entire ironing surface. There are no hot or cold spots, but the entire face of the roll can be used and the wear on the padded rolls is uniform.

On the score of cleanliness the use of electric heat has done much to reduce the chance of soiling the work in process. There are no exposed or protected flames to vitiate the air and produce soot. The electric current can be led to the machine by means of a flexible cable, and the machine can be located so that the minimum amount of rehandling of the work is required.

The Hadaway electrically heated rolls, sold by the Westinghouse Electric and Manufacturing Company, are designed with a thorough understanding of the requirements of laundry service. These rolls can be applied to any make of laundry machinery, and are guaranteed to supply a uniform heat suitable to the work for which the machine is designed. The Hadaway company is also prepared to apply electric heat to any particular machine which it is desired to equip in this manner.

The roll consists of a heavy cylinder of cast-iron in which the heating element is embedded. This heavy core serves as a thermal storage reservoir and equalizer, so that the variable demands upon the roll for heat can be efficiently served with a



ELECTRIC SAD-IRON WITH ATTACHMENT PLUG.

constant heat input. A single working heat is usually all that is provided. The single heat is sufficient to permit working the machine at its maxmum output; and when doing lighter work or smaller quantities of work the current is turned off during a portion of the working time. But the Hadaway company is prepared to supply rolls which are arranged for a high, medium and a low working temperature. These heats are secured without the use of any outside resistance, the heating element being divided and controlling switches provided by which the heat regulation is accomplished without any waste of energy.

There is a certain amount of hand ironing to be done, and the Westinghouse electric iron is particularly suitable for large laundries, hotel laundries, and factories where the iron is in continual service. A non-conducting element is used between the top of the iron and the heating unit. This construction results in the top of the iron being cooler than its face, and this is a grateful feature to the user. The Westinghouse iron is of the solid type; that is, the heating unit cannot be readily removed, and there are no loose pieces to get lost and mislaid. The heating unit is hermetically sealed in its insulation, and cannot deteriorate any faster than the iron. It is supplied with six feet of flexible cord, specially made for the purpose. A Hubbell separable attachment plug is used to connect with the lamp socket. Each sad iron is supplied with an iron stand having a heat-proof base.

The heating element of the Westinghouse sad-iron consists of a flat insulated resistance strip clamped by heavy pressure between two flat iron plates, forming a solid heating element of high thermal conductivity, and having a large heat-storage capacity. The design of the element is such that the heat is practically evenly distributed over the entire bottom of the iron.

PATTERSON WIRELESS BATTERY HOLDER

An improved connection for dry cells which seems to afford marked advantages and convenience over the usual thumb-nut or spring connections has been brought out by Stanley & Patterson, New York, who have adapted the principle of the Edison lamp socket to the dry cell connections. The scheme is shown clearly by the accompanying cut.

The new connection has the advantage of securing a large firm contact, in which there is no chance for any clamping nuts to vibrate loose or connecting wires to become broken. No error can be made in connecting up the battery through reversal of any of the cells. Any cell which has become weak can be conveniently and quickly removed from the set without breaking the current flow, since a short-circuiting spring, shown in the socket, bridges the opening when any cell is removed.

The wireless holder is made in many forms, either as an entire cabinet or as a strip which may be placed in any battery box. The new holder is

PATTERSON WIRELESS BATTERY HOLDER.

especially useful in automobile ignition work, but may be applied to almost any use. The Patterson type cells are exactly the same as the standard dry cell, 6 by 2½ inches, with the exception of the rolled thread on the zinc cup and the contact button on the carbon. For automobile use the cabinet is well finished and waterproof.

NEW WARD LEONARD METER-TESTING RHEOSTAT

A new meter-testing rheostat designed to replace the customary bank of lamps has been produced by the Ward Leonard Electric Company of Bronxville, N. Y., the well-known manufacturer of rheostats, starting boxes and controllers. The rheostat is intended for use in electric-lighting stations and is satisfactory with either direct or alternating current. The standard catalogue types are suitable for testing meters of 150-ampere capacity or less at approximately one-tenth loads. The rheo-

FIG. 1. METER-TESTING RHEOSTAT.

stats are light, mechanically strong, and are of a proper design to be readily portable.

The resistance elements are built up of Ward Leonard enameled resistance units. They are fireproof, strong and light, and are thoroughly protected against chemical, electrical and mechanical depreciation. There are several switches in parallel, as seen in the cuts, each switch controlling its respective resistance. To secure any desired current or load within the limits of the rheostat, it is merely necessary to close such switches as will allow the desired current to pass. As each resistance is designed to carry the full current that can be made to pass through it by the full line potential, burnouts are impossible.

Each switch is marked with the number of amperes that will pass when it is closed and all the

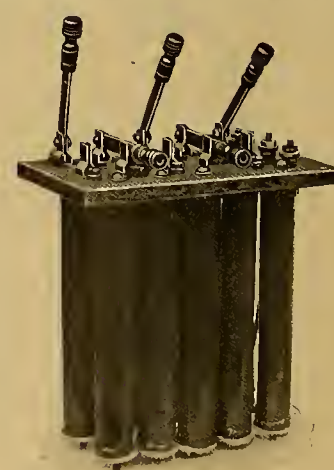


FIG. 2. METER-TESTING RHEOSTAT, SHOWING FIREPROOF RESISTANCE UNITS.

other switches are open. The frame is complete in itself. The resistances are fastened to the face-plate. The face-plate and resistances can be taken out by removing four brass screws. The Ward Leonard company will be glad to give central-station men, who state their requirements, any information that will assist them in selecting the proper rheostat. Aside from economy and ease of transportation, this apparatus presents to central-station men the advantage of testing a customer's meter quickly and accurately.

The Ward Leonard company has also built a rheostat for use upon either 110 or 220 volts. This rheostat is provided with a double-throw switch which when thrown in one position will give current readings from 0.5 to 23.5 amperes, and when the switch is thrown in the opposite direction, i. e., the 220-volt side, half-ampere steps can be obtained from 0.5 to 11.5 amperes.

Fig. 1 shows the meter-testing rheostat complete. In Fig. 2 the resistance elements are shown removed from the case.

ADVANCE IN FIXTURE DESIGN

In the lighting-fixture business it is but too true that many wonderful forms have been created and placed in various buildings without regard to whether such pieces harmonize with the surroundings. The architect, contractor and the consumer have visited fixture showrooms contemplating purchase of lighting effects for their buildings, whether such building be for public use or for the home, and have been greeted by a maze of metal so dense that it has caused confusion. After purchasing the desired amount of metal for the building there still remained a doubt whether the pieces selected were really appropriate.

For years the Central Electric Company of Chicago has been studying the situation. It has now acquired a factory equipped for the production of correct and unusual effects in metal. To secure the craftsmen for such an organization it was obliged to locate its factory in Boston, where it has now a designing department and a factory organization which, it says, is second to none in the United States. From the designer of the various effects through to the modeler, the foundry man, the toolmaker and the chaser, there must be in the temperament of each man the necessary feeling for art in its true meaning; and on all of the work produced by this company will be seen in the lines of the model, in the marks of the hammer, and the dainty lines forced by the chaser's tools the characteristics of each individual craftsman.

The following quotation will give some idea of this company's interpretation of the true meaning of the lighting-fixture business: "A lighting fixture must have two inceptions; first, in the designer's thought, made apparent by the use of the pencil, and second, by craftsmen of sterling worth."

In the Chicago studios great care was given in the arrangement of the various rooms, so that each fixture is seen individually, and under conditions which enable the purchaser to make intelligent selections. Each piece is shown lighted, thus enabling one to see the effect when the fixture is permanently placed. The sales organization is composed of representatives having a thorough knowledge of interior architectural detail, so that when a prospective client makes known the conditions existing in his building, correct suggestions can be offered. The studios are undoubtedly the most complete and beautifully decorated rooms for the display of lighting effects in the West, and every courtesy and convenience is shown prospective clients. The company cordially extends an invitation to those interested to visit its fixture studios.

LARGE 60,000-VOLT INSULATOR

An interesting shipment of insulators for high-potential power-transmission work has just been made by the New Lexington (Ohio) High-voltage Porcelain Company. It consists of the first carload of an order of 5,000 60,000-volt insulators for the Seattle-Tacoma Power Company of Seattle, Wash., sold through the E. N. Fobes Supply Company of

LARGE 60,000-VOLT INSULATOR.

Seattle, northwestern sales agent for the New Lexington company.

The accompanying illustration shows the type of insulator used. It is 14 inches in diameter and 12½ inches high and weighs 25 pounds net. This design is considered to be one of the best for 60,000-volt lines.

PROGRESS IN BOMBAY

Bombay, India, according to a recent consular report, did not enjoy the use of electric light and power until September, 1905, when the Bombay Electric Supply and Tramway Company started a public electric supply over about seven miles of mains in the European business section of the city. The advantages of electricity were speedily appreciated, and by the end of the year installations amounting to the equivalent of nearly 20,000 eight-candlepower lamps had been coupled to the mains, including over 1,000 electric fans. By April 1, 1908, the number of connected eight-candlepower lamp equivalents had risen to about 100,000, the number of fans to 4,000 and other motors to 474 horsepower. The street-car lines have also been electrified. The popularity of the electric fan over the old hand-pulled punkahs has been very marked. The company's generating capacity (6,000 horsepower) is practically reached, and extensive additions are now contemplated.

NEW TANTALUM AND TUNGSTEN LAMPS

New high-efficiency incandescent lamps just brought out by the General Electric Company fill a demand for high-efficiency units of low candlepower. Among the new lamps may be mentioned the 25-watt tantalum lamps, miniature and battery types of tungsten lamps and a complete line of tantalum lamps for train-lighting service in both round and pear-shaped bulbs, made in 30-50 volt and 60-65 volt sizes.

The 25-watt tantalum lamp gives 12½ mean horizontal candlepower. It may be burned in any position and is serviceable on alternating-current circuits of 60 cycles or less. The 25-watt lamp is made in the regular 16-candlepower carbon-lamp bulb and presents a more graceful appearance than the tantalum lamps of higher candlepower. This lamp may be used in conjunction with the tungsten lamp for ordinary socket installations where it may not be desirable to install tungsten lamps on account of their size and higher cost.

Miniature and battery types of tungsten lamps were referred to in the Western Electrician of July 4th. They are made in standard and miniature bulbs and can be supplied in any voltage from 1½ to 20 volts and from fractional candlepowers up to 24 candlepower. These lamps are particularly applicable for use in automobile service as a substitute for oil and acetylene lamps.

Aside from the miniature and low-voltage lamps, the company has also brought out a 250-watt tungsten lamp, which is designed for use where the outlets are limited and where a large unit is required to replace present illuminants. The mean horizontal candlepower of the 250-watt lamp is 200, or over 300 candlepower when used as a unit with a bowl Holophane reflector. The lamp is made in a pear-shaped bulb 5 inches in diameter and is said to be the most powerful incandescent lamp made for lighting service. One of the 250-watt lamps will effectually replace a gas "arc" or the ordinary electric arc. Recent tests of these lamps in a large department store in Newark, N. J., have shown an average life of 900 hours, it is said.

INDIANAPOLIS TELEPHONE FRANCHISE

The Board of Public Works of Indianapolis has granted a new franchise to the Indianapolis Telephone Company, providing for an increased rate, which is thought will be sufficient to guarantee a dividend of 7½ per cent. net, over and above all taxes, which are to be paid by the company before dividends are declared.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, July 1.—A visit to the establishment of Mr. Ducretet, at Paris, showed a number of new instruments and apparatus, among others a set of radio-telegraph apparatus of most modern design, in which Captain Ferrie's electrolytic coherer is used. The coherer has a fine platinum wire, protected by a glass tube, dipping in a liquid which is contained in a small cell. This form of coherer is now used in the Eiffel Tower wireless plant. The Carpentier establishment has just finished an instrument for projecting current waves upon a screen, and it has an advantage over the usual oscillographs in giving an image which is one or two feet long, according to the distance of the screen. It uses a small oscillating coil which carries a mirror. A special set of plane mirrors in connection with a revolving prism is employed to spread out the wave and throw it upon the screen. The principle of the instrument, which is designed by Mr. Abraham, was set forth in a previous issue.

Among the recent power distribution systems in Italy may be mentioned the hydro-electric plant and line which passes through the provinces of Pavia and Novara. It is controlled by the Conti firm, and the hydraulic station is located at Vigevano, in the first-mentioned province. The pole line is about 15 miles long and ends at Novara. In this case three-phase current at 25,000 volts is used. In the provinces of Brescia and Cremona is a pole line which belongs to the Brescia Company, which is the extension of a three-wire line from Brescia to Pontevico. The new line passes through the territories of Robecco and Pozzaglio and ends at a transformer post situated near Cremona. In this case the line is operated at 4,000 volts. At Pontevico several other lines branch out in different directions in the Cremona province.

An agreement has been made between the Municipal Council of Belfort, France, and the Ronchamp Coal Mining Company in relation to the supply of electric power for operating the tramways of the region. A hydro-electric plant is soon to be installed at Montrevel, in the Ain district, for the lighting of a number of localities in the region. It is proposed to erect a new hydraulic plant in the Aveyron department in order to secure a large supply of current for the different tramways.

A project is on foot for erecting several new telephone lines in Algeria. One of these will connect Jemmapes with La Robertsau, in the region of Philippeville. In the Oran province are to be built the Tizi-Mascara-Thiersville and the Oran-Misserghin lines in the near future.

At Budapest the government is taking measures for granting a concession for a suburban electric railroad which will be of great advantage for the district. At first, it is proposed to run the line as far as Rakospalota-Ujpest, but later on it may be extended further. The new line is to be used for experiments as to operating electric railroads which are to be carried out by the state with a view of securing data for use at a later period when it comes to adopting electric traction to a greater or less extent upon the through lines of railroad in Austro-Hungary. A. de C.

GREAT BRITAIN

London, July 3.—The annual convention of electrical engineers to corporations and other local authorities owning electricity works has just been completed at Nottingham. Two of the papers were on power-house design, and call for no particular mention here, but one of the remaining papers raised the debatable question of the use of accumulator sub-stations in preference to present practice. It was mentioned that very large batteries are used in America, but it was not stated for what specific purpose or whether they are used in substitution of the ordinary sub-station plant, which was the point of contention of the paper. The author advocated the installation of a number of batteries in such accumulator sub-stations, keeping one for reserve in the same way as machines are kept in reserve, and some elaborate calculations were made showing that for a 16,000-kilowatt plant there would be a saving in capital charges of about $120,000. Of course, the old question of the unreliability of batteries was brought to the front, and the suggestion that the batteries would always be discharged at the one-hour rate came in for much discussion, especially in relation to the maker's guarantees. The discussion showed there is at present little disposition on the part of municipal engineers, at any rate, to take the question up seriously, one speaking suggesting that stations for the most part in England had just begun to turn the corner and that to go in for a policy of experiment now would counteract all the good work done in the past toward securing a satisfactory financial return. By another speaker the paper was called an academic one.

The proposal mentioned last week, that the Institution of Electrical Engineers should purchase a building on the Victoria Embankment as a home for itself, has been passed at a general meeting of the members, in spite of some opposition. This was brought about by a feeling that as so little time has been given the members for consideration of the proposition, the matter was being unduly rushed through. The fact is that the Institution was offered an opion for the purchase of the building in question only a few days ago, in competition with a public body, so that there was need to act quickly.

I mentioned recently that the city of Birmingham was borrowing an exceptionally large sum for extensions to its electricity undertaking. Another example of municipal expansion is now taking at Manchester, where a loan for $700,000 is being sought for electrical purposes.

The London, Brighton and South Coast Railway Company, which is one of the pioneers of single-phase traction for heavy-railway purposes in Great Britain, intends to experiment with gasoline-electric cars on portions of its lines where the traffic is not very dense.

The co-operative exhibit which the London electric supply companies have erected at the Franco-British Exhibition has now been formally opened. It consists of a suite of rooms, including a drawing room, bedrooms and kitchen, which are fitted with every conceivable kind of electric apparatus, and the effect is very striking.

The final word with regard to electric power supply in London now rests with the House of Commons. As I have already reported, the large bulk-supply scheme has been sanctioned by the House of Lords, and some of the existing companies have been granted certain powers of mutually assisting one another, and also the right to supply railways and such like undertakings which run through the districts of several local authorities. The remainder of the London Companies have now been granted similar powers under another bill, and there the matter rests for the present.

Some of the Scotch municipalities are being threatened with a novel form of competition in connection with power supply by a company which proposes to arrange wayleaves with the railroad companies for laying its mains alongside the railway tracks and to give a supply at very cheap rates to factories and other users, and which can be tapped in this way without crossing the public roads or interfering with any other public rights of this character. At the same time this course of action will obviate the necessity for going to Parliament for powers, and thus the opposition of the local authorities already supplying electricity will be avoided. G.

NEW ENGLAND

Boston, July 11.—The Van Choate Electric Company plant in Foxboro, Mass., was sold a few days ago to the Industrial Instrument Company of Waterbury, Conn. The Van Choate plant covers about 10 acres, and was established a number of years ago at a cost of upward of half a million dollars. The concern was involved in litigation, and after many vicissitudes the establishment was sold to a German concern, which now conveys it to the Waterbury corporation. The latter employs between 1,000 and 2,000 hands in the manufacture of gauges and other recording instruments, steam and electrical. The German concern, known as the Schaeffer-Budenburg Manufacturing Company, will remove to New York, where it has a new plant nearing completion.

The New England Street Railway Club sent a special delegation to Portland, Me., on July 9th, to present to E. A. Newman, general manager of the Portland Street Railway Company, a fine loving-cup in appreciation of his recent entertainment of the club when on an outing trip to Portland.

Superitendent Fish, of the Lynn plant of the General Electric Company, contemplates taking a trip to Europe, starting about the middle of the present month.

The Boston Elevated Railway Company has filed plans for a proposed elevated structure from its present terminal in Sullivan Square, Charlestown district, through the town of Everett to Malden Center. The proposed route contemplates the erection of a bridge over Mystic River for the exclusive use of the company.

The Boston and Worcester Electric Railway stockholders will meet on July 15th to act on a proposed issue of $600,000 three-year 6 per cent. notes. It is intended to complete the double-tracking of the road with part of the proceeds, and to reduce the floating debt.

Thomas J. Gargan, of the Boston board of rapid-transit commissioners, who has been ill for some time, is reported as improving. B.

NEW YORK

New York City, July 11.—The Public Service Commission has struck a blow at the Belmont-McDonald syndicate from a new quarter in the filing of counter claims for $2,000,000 for the return of money paid the contractors for work which was never completed, it is alleged, in accordance with the specifications. Other counter claims may be filed, so that the total may reach $3,000,000. The syndicate has been claiming $6,225,000 for extra work alleged to have been done under the first subway contract.

The first elevated railroad trains to be operated on the Williamsburg Bridge were sent over that structure on Tuesday afternoon in charge of officials of the bridge department and of the Brooklyn Rapid Transit Company. Two test trains of three cars each were successfully run across. One was of the regular Brooklyn Rapid Transit equipment and the other of heavier all-steel cars. It will probably be a month before the elevated service is put into operation on the bridge. The regular service cannot be begun until the subway terminal on the Manhattan side is completed. When the Williamsburg Bridge service is placed in operation, trains will be run direct from Manhattan to Cypress Hills, Canarsie and Rockaway Beach.

The Public Service Commission has ordered the Interborough Rapid Transit Company to equip and operate two side-door trains as an experiment looking toward relieving the congestion in the Subway. The cars will be of the Arnold type, with the side doors near the ends. The trains must be ready for operation by October 15th next, and they will be used in the express service in the rush hours. A total change to side-door equipment would cost, it is estimated, $1,500,000.

Manufacturers and inventors of fenders and wheelguards have been invited to present models for practical demonstration before the Public Service Commission. The tests will be carried out during the next three months at the works of the General Electric Company at Schenectady, N. Y., and at the works of the Westinghouse Electric and Manufacturing Company, Pittsburg. Dummies, representing persons, will be placed in various positions on the tracks and the cars operated at speeds of from eight to 20 miles per hour.

The investigation of the Fire Department has occasioned the report by the commissioners of accounts that the telegraph alarm system is in such a condition that slight accidents might paralyze it to the peril of the city. It is recommended that the city should buy out the private fire-alarm concerns, particularly the Manhattan.

A revolving house, built on a turntable and designed to follow the sun or rotate at the owner's whim, has been planned by Architect Clarence True for the private home of a Fifth Avenue jeweler which will be built at Bayside, N. Y. As proposed, the house will be constructed on a turntable, which will be operated by electric power. W.

MICHIGAN

Detroit, July 11.—Surveyors have resumed work on the Michigan United Railroad line between Mason and Jackson. It is possible that the line may be placed in operation this year.

The Michigan Power Company of Lansing, the corporation that bought the wrecked dam at Diamondale, will begin reconstructing the dam and erecting an extensive power plant at once. The new dam will be of concrete, and all the apparatus in the power plant will be of the latest type.

The citizens of the village of Petersburg are considering the desirability of erecting an electric-light plant.

The Saginaw bondholders of the Detroit, Flint and Saginaw Railway have filed formal objections in the Circuit Court to the sale of the road to Isaac Applebaum of Detroit, whose bid of $50,000 was the highest received. In presenting the objection, it was said that Otto Shoup of Saginaw would be prepared to make a bid of $60,000 for the road. The court has withheld a confirmation of the sale and made an order providing that if Mr. Shoup files a bond for $5,000 as guarantee of good faith within 10 days from date, a new sale of the road open to all bidders will be set for July 23d.

After several months' consideration, the Detroit City Council has adopted the ordinance permitting the Detroit United Railway to lay T rails on Jefferson Avenue as an experiment. The ordinance provides that the rails be removed if found unsatisfactory. It is thought that the use of the T rail will greatly reduce the noise made by the cars, compared with the grooved rails which are now in use.

The Detroit City Council has approved the offer of the Edison Illuminatng Company by which the primary rate will be reduced from 16 cents to 14 cents a kilowatt-hour, effective July 1st. This is in accordance with the report made to the mayor a year ago by Mr. Crowell. The Council agrees not to ask further reduction for a period of three years. D.

OHIO

Toledo, July 11.—The electrical appliances in 94 old buildings in Toledo were examined last month by C. D. McCall, inside electric wire inspector, and his assistants. Mr. McCall reported that in most instances such changes as were requested had been made. In the five larger theaters wiring which is up to the required standard has been put in, according to the report. The electrical apparatus of theatrical companies in the city is subjected to a systematic inspection. Inspector McCall reported that in general the electrical construction in Toledo shows improvement.

The Toledo Beach summer resort has one of the most beautiful electrical displays in this section of the country.

Beginning with August 1st, the Bell Telephone Company will raise the pay of the telephone operators. The new law forbidding the companies to employ girls under 18 years of age has made the increase necessary, as it is impossible to get girls of the proper age at the prices heretofore paid.

The Reed Electric and Engineering Company of Akron, Ohio, has been awarded the contract for wiring the new Akron prison, work upon which will be begun immediately.

The Sanitary Pump Company, with a capitalization of $100,000, was incorporated in Columbus this week for the purpose of manufacturing an electrically driven water pump and water motor, invented by A. J. Pocock of Dayton.

Officers of the several traction lines entering Columbus profess themselves as well pleased with the result of the last six months' operation of their properties. Almost without exception the gross earnings show an increase over the first six months of 1907. This has been done despite the industrial depression. However, these lines depend largely on the passenger traffic for their earnings, and steam-railroad men say that while there has been a big decrease in freight earnings on their lines, the passenger business has been showing an actual increase over the first half of the last year.

Harry Lloyd of Toledo has been appointed receiver for the Toledo Urban and Interurban by Judge Bassett. The appointment was made at the request of the Union Savings Bank and Trust Company of Cincinnati, trustee for the bondholders. The basis of the appointment was the default in $25,000 interest on bonds on July 1st. The Urban and Interurban company owns an electric railway from Toledo to Perrysburg and it also leased the line of the Toledo, Bowling Green and Southern to Findlay. S.

INDIANA

Indianapolis, July 11.—The commissioners of Clinton County have ordered an election in several townships for the purpose of voting a subsidy tax in aid of the construction of the Frankfort and Delphi traction line.

Steps were taken during the past week toward the construction of an electric railway from Danville, Ind., to Indianapolis via Amo, Cataract and Clay City, Linton to be the southern terminal.

At a meeting of the directors of the Winona Interurban Railway at Goshen on July 9th steps were taken toward the construction of a spur from Milford to Nappanee. It is estimated that the cost of constructing the branch line will be $102,000. The people of the community have raised about $30,000 in aid of its construction.

Four months ago the Fowler Utilities Company, a corporation supplying light, water and heat for the town of Fowler, was placed in a receiver's hands. After operating the plant four months in an economical manner, the receiver finds that the operating expenses exceed the income $500 a month. It is probable that the court will order the plant shut down unless a new franchise is granted in the meantime, providing for greater revenue. At present flat rates are in vogue.

The C. L. Olds Construction Company of Ft. Wayne has been awarded the contract to build a municipal electric-light plant at Ligonier.

The Pennsylvania Railroad Company proposes to test the law providing that railroad companies may be compelled by ordinance of a town or city to place arc lights at any and all intersections of the railroad with streets. The test will be made at Warsaw, where such an ordinance has been recently passed. S. S.

SOUTHEASTERN STATES

Charlotte, N. C., July 11.—The granting of a charter to the Asheville and Carolina Railway Company, with $200,000 capital, to build a line from Asheville, N. C., via Hendersonville, to the state line, marks another step in the progress of the plan to connect Greenville, S. C., and possibly points south, with the mountain city in North Carolina. C. F. White of Asheville is interested.

Seeking a 34-mile extension of the Columbus (Ga.) Railroad Company's electric line from Columbus to Society Hill, Ala., via Crawford, Ala., Marvyn and other points, a conference of Alabama citizens and the Columbus Board of Trade and the electric-railway company was held recently, with good prospects of ultimate success. The projected extension represents an outlay of $300,000.

The Greensboro Electric Railway Company, Greensboro, N. C., has purchased a new 500-horsepower engine and Westinghouse equipment, which is practically ready for service, doubling the capacity of the plant.

Specifications are being prepared for a $10,000 addition to the municipal electric plant of the town of Wilson, N. C., to meet increasing demands for electric power in that town.

Work will begin soon on an electric line from Asheville to Weaverville, N. C., a distance of four or five miles, R. S. Howland and others being stockholders.

The Suburban Land and Power Company, Durham, N. C., with a quarter of a million authorized capital, has been chartered, with the right to build electric lines in Durham and several adjacent counties, and to construct and operate power and lighting plants. E. J. Parrish of Durham is the principal stockholder in the enterprise.

Fayetteville, N. C., through a public works commission, has accepted the contract offered by the Little River Power and Transmission Company to supply the municipal needs of the city for lighting and other electric power.

It is said that power from the Catawba River will soon be brought into the town of Lenoir, N. C., for use in various furniture and other manufacturing plants.

Plans are on foot looking to the establishment of an electric-railway system in Georgetown, S. C., the power to be secured from the present lighting plant, of which L. Mouzon is manager. It is proposed to operate the two systems, lighting and street railway, under the same management. L.

NORTHWESTERN STATES

Minneapolis, July 11.—The Mitchell Power Company, of Mitchell, S. D., contemplates spending about $60,000 on improvements on its plant.

It is proposed to arrange for a systematic inspection of electric wiring in Winona, Minn.

It is expected that the Northern Traction Company will construct an electric road between Chisholm and Hibbing, Minn., this year.

The Village Council of Alexandria, Minn., has accepted the plans of Engineer Burch for the new electric-light and water plant and is advertising for bids for its installation.

A deal has been consummated by which Bower & Hollingsworth, of Gettysburg, S. D., have acquired the plant of the Collins Mutual Telephone exchange. The amount involved in the deal was about $20,000. The exchange is in charge of W. H. Thompson.

Work on the building for the Hawkeye Telephone Company at Perry, Iowa, has commenced. The building will be 25 by 60 feet and equipped throughout with new furniture and fixtures, with a capacity of 1,200 telephones.

The Dubuque and Delaware County Telephone Company of Dyersville, Iowa, has been incorporated for $100,000, with C. E. McFarland as president.

The Bell Telephone Company will spend several thousand dollars in improvements in Iowa City, Iowa.

The Home Telephone Company of Oskaloosa, Iowa, has let contracts for over $30,000 worth of improvements. A two-story, fireproof building, to cost $10,000, will be erected. There will be a multiple switchboard, with an ultimate capacity of 6,400 subscribers, which will cost about $20,000.

F. C. Van Vliete of Nissaw, Minn., F. R. McElhinney of Waterloo, Iowa, and others have purchased the telephone properties of the United Exchange Company at Traer, Gladbrook and Reinbeck, Iowa, for $27,000. R.

WESTERN CANADA

Winnipeg, July 11.—Fifteen miles of the Dominion government telegraph line in Northern British Columbia was recently destroyed by bush fires. This line has proved most expensive ever since its installation, and it is possible that the government will install wireless apparatus to serve Dawson City, Yukon and the Arctic Coast. A report is now being prepared along these lines.

Since the Manitoba government announced its telephone policy applications have been received from 1,300 farmers in the province, who are anxious to have telephones installed. The farmers are clubbing together and building rural systems which will be connected by the government trunk lines.

The Central Electric Company, Portage la Prairie, Manitoba, has rejected the offer of the city council to purchase its system and is making arrangements to spend some $30,000 in additional equipment and machinery. So far the council has arrived at no definite decision regarding the construction of a municipal electric-lighting plant, but a number of the aldermen are in favor of such a step.

When the agitation for Sunday street cars was started in Winnipeg the suggestion was vigorously opposed, but when it was put to the vote the Sunday cars were favored by a good majority. Sunday cars have now been in operation in Winnipeg for some months and are proving exceptionally popular, giving working people a chance to get out to the parks which they could not do were it not for the Sunday cars. Attendance at the church services has increased rather than decreased since the operation of Sunday cars.

O. C. Morrison, manager of the Electric Light Company at Lloydminster, Sask., has written to the council of that town offering the plant for $18,000. At a special meeting of the council to consider the offer it was decided to accept it. R.

PACIFIC SLOPE

San Francisco, July 8.—It has just been announced that a sale of $4,000,000 of bonds of the California Gas and Electric Corporation has been made to a syndicate of eastern capitalists. A part of the $4,000,000 will be used to take up the floating indebtedness and the remainder will be used for the enlargement of the company's power plants and extensions of transmission lines. The California Gas and Electric system is now selling to the amount of 175,000 horsepower and will increase its generating capacity to 225,000 horsepower.

Work has been commenced at Alameda, Cal., on the relaying of tracks preliminary to the electrization of the local ferry lines. The Southern Pacific set a big construction crew at work on Encinal Avenue laying new double tracks of 80-pound rails. The portion of the work to be done first will be between Versailles Avenue and High Street, over a portion of the street recently improved.

The Western Pacific Railway has announced that the Western Union Telegraph Company is now rapidly assembling poles and other material at Stockton, to be prepared to rush the construction of a railroad telegraph line from Stockton along the Western Pacific right-of-way to Oakland. The new road will be completed next year from Salt Lake City to San Francisco.

H. A. Tedford, who is said to represent the Northern California Power Company, has filed at Redding, Cal., two notices of water appropriations, one for 5,000 inches of the water of North Battle Creek, and the other for 3,000 inches of the waters of Bailey Creek.

L. A. Frey of Northbend has been in Drain, Ore., looking over the situation with a view to installing an electric-light plant if suitable franchise can be obtained from the City Council.

Preliminary to developing power from American Lake, near Tacoma, Wash., Lucian F. Cook and others have filed claims to water rights. It is planned to flume the water from the west side of the lake to the waterfront, a distance of four miles, and to use it for operation of a power plant for generation of electricity.

Nearly all the sub-contracts have been let and much materials assembled and actual work is to commenced within a month on the new central power plant for the Puget Sound navy yard at Bremerton, Wash. The plant will supply power to every department of the yard and will do away with the present system of having a separate power plant for every department. The total cost of the new system is estimated at $450,000.

The Vancouver Traction Company, which was recently organized in Vancouver, Wash., with Albert Welch of Portland as president, has placed an order in the East for its rolling stock and sufficient material to complete the road.

By the middle of September Superintendent Youngs of the Seattle municipal electric system expects to increase the capacity of the power plant from 3,500 to 17,500 horsepower through the installation of two turbine waterwheels, two generators and two transformers, and by replacing with larger machines some of the ones now in use. Water for operation of the additional machinery will pass through six-foot wooden pipes from Cedar Lake.

According to advices from Great Falls, Mont., James J. Hill and associates have sold the property of the Great Falls Water Power and Town Site Company to John D. Ryan and others for $1,500,000. The purchasers deny that the Amalgamated Copper Company has any interest in the deal. The property embraces all of the holdings of the Great Falls Water Power and Town Site Company, a large waterpower plant at Black Eagle dam and the entire generating power of the Missouri River for a distance of 12 miles from the city of Great Falls, east to the "Big" Falls. It is probable that a large electric generating plant will be constructed at the "Big" Falls. A.

PERSONAL

Mr. C. A. Tupper of the Allis-Chalmers Company, Milwaukee, was a Chicago visitor last week.

Dr. Daniel Carhart, dean of the engineering school of the Western University of Pennsylvania, Pittsburg, has resigned after 26 years of service with the institution. Dr. A. E. Frost has been appointed to succeed Dr. Carhart in the position of dean.

Prof. Vladimir Karapetoff has been given the appointment of a full professorship at Cornell University.

Mr. Septimus Wilson of the Westinghouse office at Baltimore has been transferred to the erecting department of the San Francisco office.

Mr. Fred B. Hofft, chief engineer for Mr. W. H. Schott of Chicago, has resigned this position to accept the office of assistant general manager of the Merchants' Heat and Light Company, Indianapolis. The change took effect on July 15th.

Prof. J. Walter Esterline, associate professor of electrical engineering, Purdue University, has been engaged by the Board of Public Works of Logansport, Ind., to superintend the building of the municipal electric-light plant there. Professor Esterline will supervise the selection and installation of the machinery.

Sir Oliver Lodge was re-elected president of the Faraday Society of London last month. Among the newly elected vice-presidents and members of the council of the society are Prof. W. Hittorf, Lord Rayleigh, Prof. J. J. Thomson, Mr. S. Z. de Ferranti, Mr. R. S. Hutton and Mr. James Swinburne. The secretary of the society is Mr. F. S. Spiers.

Mr. C. O. Mailloux of New York city, who is lecturer on electrical engineering at Columbia University, has presented to the university an ondograph imported from France. The apparatus is employed in the investigation of the effects of inductance, capacity, and other disturbing phenomena upon the phase relation and wave form of electrical currents.

Mr. Frank Hedley, general manager of the Interborough Rapid Transit Company of New York, has been elected vice-president of the company, retaining his position as general manager. Mr. Hedley went to New York from Chicago in 1903. While in Chicago he was superintendent of the Lake Street Elevated Railway Company and of the Union Elevated Loop.

ELECTRIC LIGHTING

The city of Pender, Neb., has voted $7,000 in bonds for an electric-light plant.

The sum of $27,000 has been voted for a municipal electric-light plant at Hartford, Wis.

The Cisco (Tex.) Light and Power Company has been incorporated with a capital stock of $16,000.

L. Barkley of Los Angeles, Cal., is considering the establishment of an electric-light plant at Pioche, Nev.

The city of Beaufort, S. C., has voted $43,000 of bonds to construct an electric-light system and other public improvements.

It is said that the use of electricity for light, heat and power is five times greater in Chicago per capita than in London.

The Guymon (Okla.) Electric Light and Power Company has been incorporated with a capital stock of $40,000 by J. H. Wright and others.

The Beaver Dam Fuel and Light Company has been incorporated at Beaver Dam, Wis., by F. N. Pettigrew and others with a capital of $85,000.

The Campbellsport (Wis.) Electric Light and Power Company has been incorporated with a capital stock of $10,000. John F. Sharp is interested.

Laurel, Md., has voted $15,000 of bonds and employed Charles L. Reeder of Baltimore as engineer in charge of construction of an electric-light plant.

The Suburban Land and Power Company of Durham, N. C., has completed its incorporation with a capital stock of $250,000 and will build and operate electric-light and power plants.

The University of Mississippi has awarded Barber & Co., Birmingham, Ala., a contract for building complete electric power house and heating system. D. M. Kimbrough of Oxford, Tenn., is chairman of the building committee.

One of the most remarkable electric signs in the state of Ohio is being erected over Oelman's store at Dayton, O. The sign is an imitation automobile, apparently running at full speed, loaded with passengers headed for the store with the words above "Going to Oelman's Daylight Store."

ELECTRIC RAILWAYS

The Municipal Traction Company of Cleveland, O., which is operating city street-car lines under a plan carried out by Mayor Johnson in his fight against the Cleveland Electric Company, has reported a deficit of $54,916 for May. The deficit is explained to have been due to the strike. The three-cent fare, with a one-cent charge for each transfer, has been in force for two months.

The Lehigh Heat, Light and Power Company will install an electric railway at Lehigh, Iowa.

The Aurora, Elgin and Chicago Railroad is building a sub-station on Grove Avenue, near Fulton Street, in Elgin, Ill. The building alone will cost $13,900.

By action of the Chicago City Council the surface tracks of the Chicago and Oak Park Elevated Railroad Company between Fifty-second and Austin avenues are to be elevated before December 31, 1909.

Pay-as-you-enter cars only will be built for the Milwaukee street-railway system in the future. The new cars, which will be added as fast as needed, are expected to cut down the practice of "beating fares," besides allowing the conductor to give more attention to passengers entering and alighting.

The Denver and Interurban Railway has been successfully operating its new 30-mile interurban line from Denver to Boulder, Colo., for a few weeks. This single-phase road is supplied with power by the Northern Colorado Power Company. In Denver and up to the suburb, Globeville, direct current is supplied by the Denver City Tramway Company. From Louisville Junction to Boulder the road has two branches, one passing through Marshall and the other through Louisville.

A stockholder in the old Cleveland Electric Railway Company has filed a suit in the Common Pleas Court to annul the lease of the property of that corporation to the holding company which now operates the entire railway system of Cleveland on a three-cent-fare basis. It is alleged that the transfer of the property of the old company to the Municipal Traction Company was made by the directors without the necessary consent of two-thirds of the stockholders. The complaint also alleges that the Municipal company was not legally organized, and that President Dupont and others elected themselves directors of the company, pretending to be stockholders.

POWER TRANSMISSION

Plans to harness the Sandusky River near Ballville have been furnished to a company of Yaryan (Ohio) citizens by Lloyd Urich, a Detroit engineer. Power is to be supplied to Fremont, Fostoria, Tiffin and Bucyrus.

The Snee Universal Wave Motor Company is said to be constructing a power plant next to Young's Pier at Atlantic City, for generating electrical power from the ocean waves. As reported, the plant will cost $100,000 and be ready to furnish electric light in September.

The Knoxville Power Company will soon commence work on the 32,000-horsepower development of the Little Tennessee River near the North Carolina line. The development is expected to cost about $3,000,000. The total fall in the river between the dam and the power house is approximately 160 feet, and the net fall available with the dam will be 176 feet. Charles H. Treat, treasurer of the United States, is the president of the Knoxville Power Company. W. J. Oliver of Knoxville, Tenn., is the contractor, and Pressey and Weller, Washington, D. C., are the engineers.

TELEPHONE

The Buffalo Center (Iowa) Telephone and Exchange Company has been incorporated with a capital of $10,000.

The Minocqua (Wis.) Telephone Company has been incorporated by A. J. Bolger and others, with a capital of $8,000.

The Farmers' Mutual Telephone Company of Avard, Okla., has been incorporated for $8,000 by C. A. Leach and others.

The Proffitt Telephone Company is the new name of the Haskell (Tex.) Telephone Company. The capital stock has been increased from $40,000 to $100,000.

A. E. Morrison, formerly civic telephone superintendent at Edmonton, Alberta, has been appointed superintendent for the Alberta government's telephone department.

The Central Union Telephone Company has been asking for a franchise in Bartonville, Ill., but has not been able to get one, as it would not give as low a rate as the village thought it should have.

The Delaware, Lackawanna and Western Railroad will initiate a new train-dispatching system, using telephones to direct the movements of trains. Officials of the road say that the system has been adopted because it will facilitate the moving of trains, and also be a means of economy, the eight-hour law for telegraph operators having put all railroads to additional expense. The work of installing the new system is under way.

About 350 stockholders of the Farmers' Mutual Telephone Company held a meeting at Tremont, Ill., recently and perfected the organization and elected officers. The company is incorporated for $20,000 and will build a complete telephone system. John Summers of Elm Grove, Ill., was elected president, and Arthur Becker of Tremont secretary, treasurer and manager.

A number of new telephone companies are springing into existence in Saskatchewan, Canada. Among those incorporated so far during July are the following: Buck Lake Mutual Farmers' Telephone Company, Buck Lake; Saltcoats Telephone Company, Saltcoats; Wauchope People's Telephone Company, Wauchope; Lumsden Radial Telephone Company, Lumsden; Yellow Grass Telephone Company, Yellow Grass; Lang Farmers' Mutual Telephone Company, No. 2, Lang.

PUBLICATIONS

The Bulletin of the Bureau of Labor of the United States Government for March, 1908, contains articles on "Wholesale Prices, 1890-1907," and "Industrial Hygiene."

With Trumbull Cheer for July comes an interesting folded picture of a switchboard 60 feet long built by the Trumbull Electric Manufacturing Company of Plainville, Conn.

"Paistery," the monthly bulletin of the H. T. Paiste Company, Philadelphia, for July features the Paiste molding and open wire crossovers. Other new products are illustrated and described.

The July issue of Graphite, the monthly publication of the Dixon Crucible Company, Jersey City, N. J., contains a short article on "Commutation," explaining the advantages of graphite brushes.

The American Conduit Company is mailing a post-card showing a dimensioned drawing of a line entrance for a 33,000-volt circuit through the wall of the central station. Particulars of such entrance insulators may be obtained from the nearest of the company's offices at New York, Chicago and Los Angeles.

Single-phase motors manufactured by the Century Electric Company of St. Louis are described in an attractive catalogue—Bulletin No. 10—just received. Motors up to 10 horsepower are listed. The company devotes its entire time and attention to the manufacture of single-phase motors, with the result, it declares, that it is able to produce a motor that is high-grade from every point of view.

"Something Electrical for Everybody" is the pleasing title of Catalogue No. 24, issued by the Manhattan Electrical Supply Company of New York and 188 Fifth Avenue, Chicago. The catalogue is conveniently arranged and copiously illustrated. It is notably compact, and in its 168 pages one can find a surprisingly large number of articles listed and illustrated. Prices are given, and a good index makes the catalogue easy to consult.

The Central Electric Company, Chicago, is distributing a folder entitled "Daylight at Night," describing the Columbia tungsten lamps, for which it has the general western sales agency. Considerable prominence is given to the fact that immediate deliveries on these lamps can be given from the company's Chicago warehouse. Information is given as to the watt consumption compared to carbon-filament lamps, this comparison being worked out on the basis of both five cents and 10 cents per kilowatt-hour.

Of interest to companies having large steam-driven power plants is the Brown Hoisting Machinery Company's new catalogue O, which is devoted to "Brownhoist" machinery for the rapid and economical handling of coal, ashes, coke and other material in bulk. Much of this machinery is particularly serviceable for unloading coal from barges and coal cars. Locomotive grab-bucket cranes, electrically operated traveling cranes, with man-riding trolleys for handling coal, electric coal larries and telescoping coke pushers are also among the machines illustrated. Copies of the catalogue may be had by addressing the company at Cleveland, Ohio.

Crocker-Wheeler Bulletin No. 105, dated June, 1908, gives a complete description of the company's constant-speed polyphase induction motors in large sizes, with illustrations of the machines, starting apparatus and installations. Although induction motors are applicable to any kind of service, owing to the absence of commutator or brushes, they are particularly useful for plants like powder or paint mills, or wherever there is danger of fire or explosion. Their running characteristics are similar to shunt motors on direct current. This constant speed is an advantage in textile-mill operation. A number of views of mill interiors with these induction motors installed are shown in the bulletin.

SOCIETIES AND SCHOOLS

The Dayton (Ohio) Electric Club, at a recent meeting, decided to open permanent quarters, which will be open to members at all times. The club has acted upon a number of applications for membership, and is growing. The club is not a trade organization, and no one company is predominant in its organization. All persons having charge of electrical departments or who are at all interested in the study of electricity are eligible to membership.

The Indiana Sanitary and Water Supply Association was formed in Indianapolis at a conference of 55 representatives of municipal and private-owned waterworks, held on July 8th and 9th. Frank Jordan, of the Indianapolis Water Company, is secretary of the association. As a result of the first meeting of the new association, several new lines of work are to be taken up. Statistics will be gathered, and an effort made to arouse the people to the very serious situation that exists relative to the water supply.

The Highland Park College of Engineering of Des Moines, Iowa, in addition to regular college courses in engineering, offers a practical one-year course in electrical engineering, a one-year course in steam engineering and a one-year course in mechanical drawing. There is also a short course in traction, gas and oil engineering. This special course in these subjects may be completed in three months. Very little class work is offered in these subjects, the work being strictly of a practical nature. In addition there is a one-year machinists' course. The machine shops at Highland Park College are especially complete.

MISCELLANEOUS

The Arnold Company, Chicago, has about completed the installation of the 3,000-horsepower power plant for the new locomotive repair shops of the Big Four Railroad, at Beech Grove, near Indianapolis, Ind.

An electrical cow-milking machine is at present sought in Italy, especially in Lombardy, the chief agricultural center of the kingdom. Nothing of the kind is at present in the Italian market, and now seems to be the right time for the American manufacturer to exploit his article. A similar apparatus is offered by foreign agents, but Italian importers wish to get directly in touch with the manufacturer. Electrical cow-milking machines weighing more than 2,204 pounds each are dutiable at $3.09 per 220 pounds; those weighing 2,204 pounds or less are dutiable at $4.82 per 220 pounds.

The new plant of the American Loose Leaf Manufacturing Company in the new Allis Building, 12-22 South Green Street, Chicago, is completely equipped with electric power. Each of the printing presses, perforating, cutting and ruling machines has either its own individual motor or is placed in a small motor-driven group. Among the machines is a Harris automatic press which feeds automatically, prints in two colors and perforates in two directions from 8,000 to 10,000 sheets per hour. Ten direct-current 120-volt motors are used. They are supplied by a motor-generator set driven by a 440-volt induction motor connected with the three-phase, 60-cycle power circuit in the building. This set is of Allis-Chalmers make, as is also the main 60-kilowatt generator and the 175-horsepower Corliss engine constituting the isolated plant of the building.

TRADE NEWS

The Gross Electric Company, electrical and mechanical engineers, has been incorporated in Hoboken, N. J., with a capital of $25,000 by H. Wilkins, C. B. Wilkins and S. Gross.

The following-named officers of the Crocker-Wheeler Company, manufacturers and electrical engineers of Ampere, N. J., were elected on July 10: President, S. S. Wheeler; vice-president and chief engineer, Gano Dunn; second vice-president, A. L. Doremus; secretary, Rodman Gilder; treasurer, W. L. Brownell; assistant secretary, J. B. Milliken; assistant treasurer, G. W. Bower.

Consul Alfred A. Winslow of Valparaiso reports that the management of the state railways of Chile has advertised for bids for the construction of an electric plant at San Eugenio, comprising the building and the machinery for the production of electricity for the shops and the lighting of the stations, with a capacity of 900 kilowatts, divided into three units of 300 each. No proposals will be considered that are not made upon the form that will be found in duplicate on the leaf of specifications furnished free of charge by the engineer of the technical office upon a deposit of 60 pesos with the central cashier of the service. At the time of receiving the specifications the bidder or his representatives will sign the volume kept for this purpose in the central office, giving his name and the location of the home office. The proposals will be opened on November 2, 1908, at 3 p. m., in the office of the director-general of the state railways, Santiago, Chile.

Sealed proposals will be received by the Supervising Architect of the Treasury Department until August 19th for extension, remodeling, etc., including plumbing, gas piping, heating apparatus, electric conduits and wiring, in the Post Office building at Petersburg, Va., in accordance with drawings and specifications, which may be obtained from the supervising architect or the office of the custodian at Petersburg, Va.

BUSINESS

Dossert & Co., 242 West Forty-first street, New York, report orders for 24 special solderless clamp connectors to be used in connection with Dossert cable taps as an anti-creeping device on the signal system of the New York Central electrical division. The same firm has received orders also for 200 two-way reducers to be used in connecting the feeder cables to the switchboards in the Emporium Building in San Francisco. These reducers range in size from 450,000-circular-mil cable to ¾-inch solid rod down to No. 2 solid. This order also includes 400 terminal lugs ranging from 1,000,000 circular mils down to No. 6.

The equipment of the power house of M. Straus & Sons of Newark, N. J., was installed several months ago in their new leather-treating plant. All of the machinery, including engine, generator, exciter, induction motors and switchboard, was purchased from a single builder, Allis-Chalmers Company, Milwaukee. The induction-motor equipment includes thirty motors of Allis-Chalmers Company's standard "AN" type, 220-volt, three phase.

Hayden Eames, general manager of the Studebaker Automobile Company of South Bend, Ind., says: "The Studebaker Model 22 is a proper compromise and is designed for the service and application only for which the electric pleasure vehicle is pre-eminently suited. It is not designed to compete with touring cars, or perform show feats of any kind, and although it can be and has been made to do such stunts privately, we do not favor any attempt to sell cars upon such records."

A 10-gallon glue cooker has been shipped to the J. B. Lyon Company, Albany, N. Y., by the Westinghouse Electric and Manufacturing Company. The Westinghouse Company builds a line of these cookers ranging from five to 25 gallons in capacity, and they are used by the manufacturers of printing-press rollers, bookbinders and large cabinet work shops where it is necessary to melt and keep in working condition large quantities of glue or other compositions for replenishing the smaller glue pots used on the bench. These glue cookers are arranged with two heats, a high heat for melting down raw stock, and a low heat for holding the stock at a working consistency.

The H. Krantz Manufacturing Company of Brooklyn, maker of switchboards, knife switches, etc., calls attention to the location of its representatives in various cities. F. R. Jenkins, of 938 Monadnock Building, represents the company in Chicago.

DATES AHEAD.

Michigan Electric Association (annual meeting), Grand Rapids, Mich., August 18th to 21st.

International Association of Municipal Electricians (annual convention), Detroit, Mich., August 19th, 20th, 21st.

Ohio Electric Light Association (annual convention), Hotel Victory, Put-in-Bay Island, August 25th, 26th and 27th.

Old Time Telegraphers' Association and Society of the United States Military Telegraph Corps (annual reunion), Cataract-International Hotel, September 16th to 18th.

Colorado Electric Light, Power and Railway Association (annual convention), Glenwood Springs, Colo., September 16th, 17th and 18th.

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

Chicago Electrical Show (fourth annual), Coliseum, January 11 to 23, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) July 7, 1908

892,410. Switch Mounting. Arnold E. De France, Toledo, Ohio. Application filed October 4, 1907.

The sheet-metal base for a snap switch has upturned margins and perforations that hold flexible tubing for the conductors. The bottom plate and inclosure for the switch are assembled so that they may be readily secured to a wall.

892,411. Insulated Coupling for Electric Conductors. John J. Dossert, New York, N. Y., assignor to Dossert & Company. Application filed March 8, 1906.

A metallic coupler comprises two end pieces and an intermediate connecting member having a central portion of larger diameter than the end pieces. In combination with it is a two-part insulating coupler outside the metallic couplers, the insulating sections being directly connected with each other and held from excessive longitudinal movement by the connecting member.

892,417. Plating Machine. Charles Glover, New Britain, Conn. Application filed October 22, 1907.

A tank is provided with a rotatable shaft having frames spaced apart on it and removable means comprising an electrode and container connected with the frames for supporting the articles to be plated.

892,419. System of Electric-motor Control. Fletcher D. Hallock, Wilkinsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company. Application filed December 3, 1906.

The starting resistance for a motor is provided with a number of short-circuiting switches therefor, an automatic interrupter in the motor circuit tending to open when closed, and means independent of the short-circuiting switches for preventing the closure of the interrupter when any portion of the resistance is short-circuited.

892,421. System of Electric-motor Control. Ford W. Harris, Wilkinsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company. Application filed September 5, 1905.

This controller has a number of independently-movable switches and means jointly controlled by the switches arranged to remain inoperative upon their closing serially in a predetermined order and to break the circuit automatically upon the closing of the switches out of proper order.

892,425. Water-level Indicator. William C. Horner, Nashville, Tenn. Application filed February 13, 1908.

A tank has a float arranged to close an electric alarm circuit. The battery and alarm are contained in an adjoining casing.

892,429. System of Electric-motor Control. Henry D. James, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company. Application filed November 3, 1906.

A motor-starting-device comprises a series of manually operated accelerating switches, electrically released mechanical means for preventing the closure of the same except in a definite order, and electrical means for delaying the closure of each until the automatic fulfilment of predetermined conditions.

892,441. Electrotherapeutic Generator. Samuel N. Metzler, Indianapolis, Ind. Application filed March 9, 1908.

The body of the generator includes a heating apparatus consisting of a number of boilers, a hood adapted to receive the head of the patient, pipes communicating with the boilers and adapted to convey steam to both the hood and body, means for controlling both the volume and direction of travel of the steam, and means on the hood adapted to control the admission of air to the hood.

892,445. Electric-lighting System for Automobiles. Frank L. Parrill, Vincennes, Ind. Application filed October 19, 1907.

The shaft of the lighting dynamo carries a friction disk adapted to engage the flywheel of the propelling motor.

892,448. Vehicle Washer. Leverett E. Rhodes, Hartford, Conn. Application filed September 11, 1907.

In combination wtih a system of delivery pipes are connections for an electric lamp supported on the head of the device.

892,464. Controller. Emmett W. Stull, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed June 30, 1906.

A motor controller is equipped with a magnetically operated switch through which the motor current is always supplied and which is so arranged that it is opened when the controller is moved backward into its first operative position.

892,470. System of Distribution. Hermon L. Van Valkenburg, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed September 29, 1906.

In a polyphase system there are a number of series transformers, a measuring instrument, and a number of double-throw instrument switches for connecting the instrument to the transformers so as to measure the current in any one phase, the switches being so constructed that the transformers can never be open-circuited.

892,475. Arc-lamp Regulating Mechanism. Ernest P. Warner and Carl Wiler, Chicago, Ill., assignors to the Western Electric Company, Chicago, Ill. Application filed January 15, 1906.

The mechanism comprises a feed clutch, an electromagnet having an armature movable in a vertical direction, a retarding device, and a lever connected at one end with the feed clutch, at its other end with the retarding device and intermediate its ends with the armature.

892,477. Sign-flashing Apparatus. Gustaf Wesley, St. Paul, Minn. Application filed March 7, 1905.

There are a number of radially arranged knife-switches, a number of cams, and means for carrying one cam into position successively to engage with and open the switches and the succeeding cam into position successively to engage with and close the switches.

892,486. Process for Purifying Water and Sewage. Albert E. Woolf, New York, N. Y. Application filed January 11, 1908.

The process of treating liquid to be filtered, whereby the filter bed shall be maintained in operative sterile condition, consists in adding a small percentage of electrolytically produced disinfecting solution to the liquid prior to complete filtration.

892,487. Turbo-generator Construction. Alfred H. Wouters, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed November 3, 1906.

The armature has a core and end-member, conductors carried by the core and having projecting portions resting on the end-member, a ring surrounding the coils and resting on the end-member, the ring and end-member having respectively internal and external registering grooves, and a readily removable contractible rod normally located in both the grooves.

892,500. Battery Indicator. Rufus N. Chamberlain, Depew, N. Y., assignor to the Gould Storage Battery Company, New York, N. Y. Application filed November 11, 1903.

In a storage-battery indicator, there is a movable indicating member, a permanent magnet, a movable actuating coil for the indicating member arranged between the pole pieces of the magnet, a modifying coil applied to the pole pieces, and a variable shunt arranged across the modifying coil. (See cut on next page.)

892,516. Process of Producing Concentrated Nitric Acid. Birger F. Halvorsen, Christiania, Norway. Application filed February 9, 1906.

The process consists in dissolving sulphuric acid containing an oxide of nitrogen in sulphuric acid, treating the solution so obtained with oxide of chronium, evaporating the nitric acid formed, and recovering the oxide of chromium.

892,554. Shunt. Frank W. Roller, Plainfield, N. J., assignor to the Whitney Electrical Instrument Company. Application filed June 9, 1905.

A shunt for electrical measuring instruments consists of a conductor having alternate slots extending inwardly from the opposite sides, the conductor being of relatively large width as compared with its thickness.

892,557. Rail Joint. Howard S. Shafer, Nazareth, Pa. Application filed July 11, 1907.

A rail joint for electric railways has a longitudinal socket in each rail end, into which is fitted a connecting and conducting pin.

892,572. Signal Device. Joshua W. Atlee, Riverton, N. J. Application filed January 11, 1906.

A nautical signal device is provided with sound-producing apparatus and a number of electric lamps arranged to present an elongated bar of light.

892,576. Time-limit Circuit Closer. Walter W. Brown, Schenectady, N. Y., assignor to the General Electric Company. Application filed December 26, 1907.

This circuit closer comprises a rotatably mounted metallic casing, a vessel embedded in cement within the casing containing a conducting fluid and having two chambers connected by a large and a restricted opening, and circuit terminals in one of the chambers.

892,586. Automatic Electric Motor-driven Mail and Package Deliverer. George H. Ferlin, San Diego, Cal., assignor to Dora Weingard, San Diego, Cal. Application filed May 1, 1907.

In combination with a horizontally extending track is a carrier having wheels engaging under and over the track, an approximately vertically extending rail having one end curved into tangential relation to the track and over which the carrier travels, and electrical means for propelling the carrier on the rail.

892,608. Electric Battery. William Morrison, Chicago, Ill., assignor to George Rumrill Coryell, Chicago, Ill. Application filed August 11, 1902.

This storage battery has a positive and negative element, a bromine electrolyte, the negative element being independent, but so disposed that it is below the upper surface or boundary of the bromine electrolytically deposited when the battery is charged.

892,616. Means for Controlling Machinery. Henry A. Peters and Charles W. Morgan, Paterson, N. J. Application filed March 18, 1908.

In combination with a conductor and a controller therefor normally adapted to move from one to the other of the closing and opening positions, is a detent engagable with the controller to restrain the same against movement, a part normally adapted to move the detent and cause it to release the controller, and means for normally restraining this part against actuating the detent.

892,626. Electrical Insulator. Hugo F. Selinger, St. Louis, Mo., assignor to the Wagner Electric Manufacturing Company, St. Louis, Mo. Application filed December 12, 1907.

The insulator has a body portion adapted to be secured in a casing and provided with a passage for a conductor that is enlarged at its upper end to form a cement well. A bead is provided with a laterally opening channel communicating with the passage.

892,636. Controlling Apparatus for Railway Appliances. Hiram C. Williams, Utica, and Francis B. Harrington, Albany, N. Y., assignors to the General Electric Company. Application filed November 4, 1907.

A rotatably mounted fitting is operatively connected to one of a set of interlocked levers, and a receptacle adapted to contain mercury is carried thereby. It has two chambers joined by a large and a restricted passage, circuit-terminals in one of the chambers, an electromagnet in circuit with the terminals, and means controlled by the electromagnet for locking another of the levers.

892,637. Controlling Means for Railway Apparatus. Hiram C. Williams, Utica, and Francis B. Harrington, Albany, N. Y., assignors to the General Electric Company. Application filed March 25, 1908.

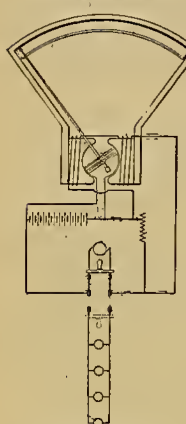
This is a modification of the preceding device.

892,655. Battery-charging Apparatus. Frederick G. Duryee, Fort Wayne, Ind. Application filed December 17, 1906.

Details of an electromagnetic circuit-breaker are described which is adapted to cut off the charging current when the storage battery is fully charged.

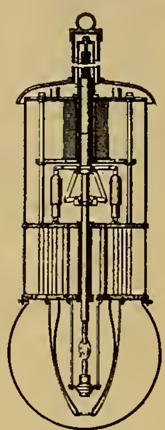
892,656. Controller for Alternating-current Motors. George W. Enker, Boston, Mass., assignor to the Diehl Manufacturing Company. Application filed August 27, 1907.

The controller has an inductance winding, means for varying the inductance thereof, thus operating to initially close the shunt circuit of the motor, and thereafter to close its series circuit.

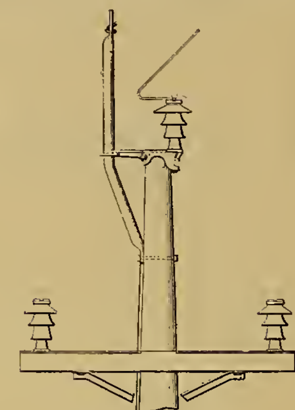


No. 892,500.—BATTERY INDICATOR.

No. 892,763.—INDUCTION COIL UNIT.



No. 892,768.—ARC LAMP.



No. 892,822.—POLE-TOP CAP.

892,670. Electric Snap Switch. Walter S. Mayer, Philadelphia, Pa., assignor to the Machen & Mayer Electrical Manufacturing Company, Philadelphia, Pa. Application filed January 2, 1907.

The construction of a rotary snap switch is described in detail.

892,677. Safety Appliance for Electric-railway Trains. Edwin T. Munger, Chicago, Ill. Application filed December 2, 1907.

The train is equipped with a brake system, a number of brake-controlling mechanisms therefor, an electric-motor controller, and means associated with the brake-controlling mechanisms for rendering the motor controller inoperative when any of the brake mechanisms is in a condition to prevent setting the brakes.

892,712. Safety Appliance for Electric-railway Trains. Adolph H. Daus, Chicago, Ill. Application filed December 2, 1907.

Across an electromagnetic mechanism connected with the main controller is a low-resistance shunt that is closed by the valve controlling the pneumatic brake mechanism when it is in a position to apply the brakes.

892,713. Safety Device for Electric Trains. Adolph H. Daus, Chicago, Ill. Application filed December 30, 1907.

This is a modified form of the appliance described above and is applicable to a car with two controllers.

892,721. Electric-lamp Socket. John H. Hanson, Chicago, Ill. Application filed June 3, 1907.

A pull-socket construction provides an operating clutch for moving the contacts.

892,734. Safety Appliance for Electric-railway Trains. Harley A. Johnson, La Grange, Ill. Application filed December 2, 1907.

This appliance combines a number of safety features, one of which is the rendering of the motor controllers inoperative when the pressure in the air-brake system is not sufficient to operate the brakes.

892,749. Electric-sign Apparatus. Richard F. Le Brocq, Etna, N. J., assignor of one-half to Edwin J. Selley, New York, N. Y. Application filed February 25, 1907. Renewed June 1, 1908.

The lamps of the sign are arranged in sets, each set being connected to a contact on a drum. An electromagnetically controlled pawl and ratchet moves a contact brush over the contacts.

892,755. Plug for Electrical Connections. Walter S. Mayer, Philadelphia, Pa., assignor to the Machen & Mayer Electrical Manufacturing Company, Philadelphia, Pa. Application filed August 26, 1907.

The plug consists of an insulating body having perforations which are located out of alignment upon its opposite sides and contacts located upon the opposite sides of the body, and having projecting arms extending into the perforations.

892,763. Induction-coil Unit. Carl A. Pfanstiehl, Highland Park, Ill. Application filed November 11, 1907.

A coil section is made of a pair of outer spool heads formed with central orifices and annular necks, one of which fits over the other, an intermediate head formed with a corresponding orifice and with a small passage adjacent thereto, and reversed coil windings in the annular cavities between the heads and connected together by a wire extension passing through the small passage. (See cut.)

892,764. High-frequency Apparatus. Charles C. Ruprecht, Cleveland, Ohio, assignor to the Cleveland High Frequency Company, Cleveland, Ohio. Application filed February 4, 1907.

The apparatus includes a transformer, a condenser, a circuit-breaker for discharging the same, and a separate circuit having therein a periodically operating actuating device for the circuit-breaker, the periodicity of which is independent of the frequency of the circuit.

892,768. Electric-arc Lamp. Charles P. Steinmetz, Schenectady, N. Y., assignor to the General Electric Company. Application filed May 31, 1902.

Means are provided for creating within the lamp a circular air current carrying smoke and other products of combustion from the arc, and there is a depositing chamber constituting a part of the air circuit. (See cut.)

892,770. Apparatus for Governing the Passage of Cars or Vehicles Along a Railway. John D. Taylor, Wilkinsburg, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Application filed January 17, 1905.

In combination with an electric motor for moving an appliance controlling the passage of cars or vehicles along a railroad is a lever for controlling the supply of current to the motor, an indication mechanism for the lever comprising a latch and electromagnetic means for operating the latch.

892,811. Safety Apparatus for Cars or Trains. John P. Coleman, Edgewood, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Application filed March 14, 1905.

A trip mechanism along the track is adapted to cut off the power to the motor when set at safety.

892,814. Electric Indicating System for Railways. Herbert G. Dorsey, Ithaca, N. Y. Application filed November 5, 1907.

The system includes a pair of conductors paralleling the road-bed, means carried by each train for generating current in direct proportion to the speed of the train and having connections engaging with the conductors, and means in one of the connections serving to indicate the speed and direction of travel of a second train similarly equipped and having connections with the same conductors.

892,822. Pole-top Cap. James W. Fraser, Charlotte, N. C. Application filed November 11, 1907.

The cap comprises a plate having a socket for receiving the end of the pole, and an opening for an insulator pin, a vertical arm on the other end of the plate, the upper end of which has means for supporting a protector wire, and the lower end with means for connection with a ground wire. (See cut.)

892,833. Motor-valve Mechanism. Ernest G. Howard, Springfield, Mass., assignor to Chapman Valve Manufacturing Company, Springfield, Mass. Application filed May 15, 1902.

A motor-operated gate valve has a motor with a hollow armature shaft geared to a sleeved nut that is threaded on the valve stem.

892,841. System of Control. Henry D. James, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company. Original application filed May 6, 1907. Divided and this application filed September 3, 1907.

A sectional resistance in the armature circuit of a motor has a number of switches for removing the resistance from the circuit, and controlling magnet windings arranged to be connected to different points of the resistance.

892,857. Electrically Operated Signal for Railway Crossings. George W. Lancaster, Richmond, Va., assignor to the Lancaster Automatic Railway Crossing Company, Inc., Richmond, Va. Application filed April 30, 1907.

A set of signals on each track on each side of a crossing is provided with means for throwing some of the signals to caution as a train approaches the same, and means for throwing to danger the signals nearest the crossing as the train approaches the crossing.

892,865. Pit Furnace Cover-operating Mechanism. David L. Meckel, Ben Avon, Pa., assignor of one-tenth to Luther K. Yoder, Pittsburg, Pa. Application filed January 25, 1907.

A pit-furnace cover has a rack directly connected thereto for moving the same, an electric motor, and mechanism directly connected to the rack and to the armature shaft of the motor.

892,868. Clutch. Thomas G. Morse, Erie, Pa., assignor to the Morse Iron Works, Erie, Pa. Application filed September 28, 1907.

The clutch consists of a loosely journaled overhanging-rim clutch member, radially movable jaws adapted to engage the inside of the rim mounted on the other clutch member, a rotatable sleeve, projections thereon adapted to move the jaws outward against the rim, and electrical mechanism for rotating the sleeve.

892,872. Electric Switch. Hervey H. McIntire, South Bend, Ind. Application filed September 27, 1904.

The switch has two contract terminals longitudinally in line with each other. The lower one is moved by means of a rod.

892,874. Overhead Trolley-wire Crossing. Richard C. McKiliget, New Orleans, La. Application filed June 18, 1907.

A number of independent conductors are each connected to an inverted trough-shaped member fastened at any desired angle to an insulated center piece.

892,882. Electric Safety Signal for Railways. John Pernat and Johan Kerkowitz, Cleveland, Ohio. Application filed January 25, 1908.

A wooden beam carrying two contact wheels insulated from each other and engaging the track rails is mounted near the cow-catcher of the locomotive. The contact wheels connect to a signal circuit on the engine.

892,915. Stop Motion. Edward E. Taliaferro, Colorado Springs, Colo., assignor of one-sixth to Harry Spingler, Colorado Springs, Colo. Original application filed June 30, 1906. Divided and this application filed July 18, 1907.

There are means controllable by the release of the driving member from the driven member for disconnecting the source of electric power therefrom, and mechanism controllable partly by the driven member and partly by the driving member for disconnecting the members.

892,928. Swivel Joint for Electric Wires. Horatio A. Black, Toledo, Ohio, assignor of one-half to Samuel E. Starr, Toledo, Ohio. Application filed October 24, 1907.

A pair of telescope tubes is arranged for axial rotation one upon the other and secured against longitudinal separation. A pair of contact plates is insulated from each other and from the tubes and rotatable with one of the tubes. A pair of brushes is rotatable with the other tube and in contact with the plates.

892,931. Lifting Magnet. Victor R. Browning, Nottingham, Ohio. Application filed December 14, 1906.

This magnet is provided with a main member having a central projection forming an inner pole of the magnet, a member surrounding the projection forming an outer pole member, a magnetic coil between the poles, and a sub-pole magnetically separated from the coils and the inner pole.

Reissue.

12,828. Ringer for Telephones and the Like. Elbert R. Hobbs, Lamar, Colo., assignor to the Dean Electric Company. Application filed December 17, 1906. Original No. 809,060, dated January 2, 1906.

In combination with a magnet and a supporting plate is a mechanism provided with brackets, springs connected with the brackets and depending therefrom, an armature mounted upon the springs and free to rock by the resilience thereof, and means for adjusting the position of the brackets relatively to the supporting plate.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired July 14, 1908:

455,765. Electric Motor. H. H. Porter, New York, N. Y.
455,773. Alternating-current Motor. Wm. Stanley, Jr., Pittsfield, Mass., and J. F. Kelly, New York, N. Y.
455,788. Thermostat. H. A. Chase, Boston, Mass.
455,790. Dynamo-electric Machine or Motor. J. B. Entz, New York, N. Y.
455,800. Electric Cut-off Apparatus. E. W. Rice, Jr., Lynn, Mass.
455,808. Electromagnetic Ore Separator. J. Wenstrom, Orebro, Sweden.
455,815. Electro Phonometer and Phonoscope. I. H. Farnham, Wellesley, Mass.
455,837. Electric Switch. C. G. Dahlgren and J. H. Svensson, Gothenburg, Sweden.
455,887. Armature for Dynamo-electric Machines. E. W. Rice, Jr., Lynn, Mass.
455,898. Electric Motor or Dynamo-electric Machine. C. C. Curtis, New York, N. Y.
455,953. Cut-out for Arc Lamps. C. E. Scribner, Chicago, Ill.
455,956. Electric-railway System. S. P. Wilcox, Elkhart, Ind., and J. D. Partello, Rochester, Mich.
455,968. Secondary Battery Plate. J. R. MacLaughlan, Philadelphia, Pa.
455,971. Armature for Dynamos. F. L. McGahan, Indianapolis, Ind.
455,981. Apparatus for Administering Electricity. G. H. Bethel, Sidney, New South Wales.
455,986. Terminal for Electric Batteries. H. V. Hayes, Cambridge, Mass., and A. S. Hibbard, Morristown, N. J.
456,110. Automatic Circuit Closer for Telegraph Keys. J. W. Brown, Van Wert, Ohio.
456,120. Insulated Electric Conductor. E. D. McCracken, Alpine, N. J.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, JULY 25, 1908 No. 4

DENVER'S ELECTRICAL GREETING

By John M. Connelly.

Denver came into her own in more ways than one during the national convention of the Democratic party during the week beginning July 7th. Besides earning the compliment of being able to handle a big political convention with great success, it demonstrated that it had much reason to claim just recognition as a "City of Lights."

Those who have followed the efforts of the Denver Gas and Electric Company and Denver's commercial bodies to make Denver known as a "City of Lights" will be interested to know that the lighting of the city was one of the features of the city's physical appearance which had a strong appealing force with the 25,000 or more visitors big "Welcome Arch" at the foot of Seventeenth Street. This was built by private subscription and was meant to exemplify the great favor and enthusiasm accorded to liberal private and public lighting. All the visitors who trooped through it after their arrival in the city were greatly impressed with the sight and felt that its cheering hospitality had the right kind of sincerity behind it. There certainly could be no better institution for a city than something like this to extend a cordial "handshake" to all strangers coming within its gates.

But Denver did not depend on her Welcome Arch entirely. She had much more up her sleeve. As the visitors rode or walked up Seventeenth Street they were greeted by a blaze of light that left no doubt that Denver was out to surpass nominations there was hardly a time when there wasn't a big crowd of delegates cheering and howling in front of the big sign.

The following extract from an article in the Denver Post shows how the lighting was taken locally:

"When it was suggested to advertise Denver as the 'City of Lights' the response was hearty and enthusiastic. To have the best lighted city in the country had a strong appealing force to every Denver booster, and in a short time the private lighting was more lavish and artistic than that of any other city of its size in the country.

"Then followed the clamor for better public lighting when it was seen what a marked impression the private lighting made, and what a wide influence it had in advertising the city.

Fifteenth Street

Seventeenth Street

Miss Denver Presenting Key of Welcome to Democratic Donkey.—Sign on Roof of Denver Gas and Electric Company.—After Mr. Bryan's Nomination the Figure Astride the Donkey was Illuminated

Lawrence Street

Sixteenth Street

DENVER'S ELECTRICAL GREETING TO DEMOCRATIC NATIONAL CONVENTION

who traveled to the "Queen City of the Plains" to see Mr. Bryan put in nomination for the presidency for the third time.

The hundred or more special writers representing the big press associations and the leading newspapers of the country were free and flattering in their praise of the lighting in the early reports which were sent out during the convention. The New York Sun, for instance, printed the following about the lighting:

"Multiply the White Light district of Broadway a thousand times and you may have some idea of it. The principal streets for miles were arched with parti-colored electric lights, the big buildings were outlined in the same fashion, and through these streets moved at intervals a string of trolley cars festooned with lights, each carrying a band."

So that Denver is to be pardoned if she insists that she has a good right always to put at the end of her name "The City of Lights" and with as much honest pride as the college graduate takes in appending the letters of his degree to his "John Hancock."

The citizens of Denver now feel that they never did a wiser piece of work than to construct the everything in lighting the visitors had ever seen before. Every one of the numerous electric signs shone with a holiday appearance, and festoons studded with many incandescent lights in red, white and blue were stretched across the street at intervals of 30 feet. In each block on this street, as well as on every street of the business section, there was an illuminated celluloid portrait of Democratic statesmen from every state in the Union, so that every block was of particular interest to someone.

By far the best feature of the lighting was an electric sign on the roof of the office building of the Denver Gas and Electric Company. This was built of wire netting on a framework of two-inch piping. It showed the figure of a woman representing Miss Denver presenting the key of the city to the Democratic party, typified by the figure of a donkey. As the office is in the hotel district the visiting hosts saw it early in the week and were much amused by it.

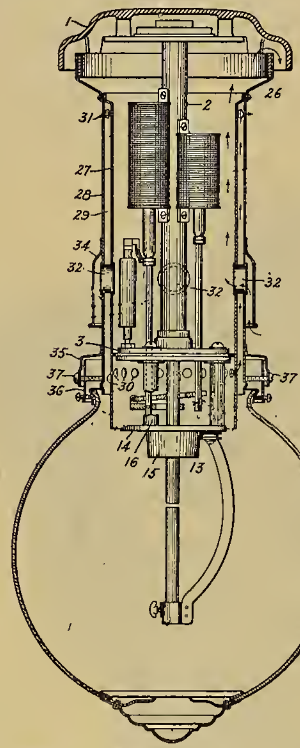
On the night Bryan was nominated the interest in the sign was increased by adding to it the figure of the candidate astride the donkey. When the Democrats saw this their enthusiasm was boundless, and on the night following the "The Denver Gas and Electric Company established a newspaper bureau to help in the cause. It had a selfish motive, perhaps, but in boosting Denver it knew that while it boosted its own interests it would be a mighty help to all other interests and to every individual in the city. It sent out newspaper stories describing the virtues of the Denver climate, the resources of the city and state and every other fact that would attract people to this point either to visit or make their residence here. It has departed from the usual policy of corporations because it has worked on the theory that whatever advertises Denver for the best results meant that its profits would increase with the greater prosperity of the community.

"The narrow spirit of feeling that others would be benefited from its wide activity to advertise the city at home and abroad, never for a moment kept the company from putting forth its best efforts and its money to say the best word in its power for Denver. 'Boost Denver, the City of Lights,' has always been its particular slogan, and its voice has never weakened nor will it in the future.

"During this convention its liberality has been evidenced, not only in doing its share to bring the Democrats here, but to show them a city that Denver citizens may say with pride is the best and most artistically illuminated in the world. It has gone to the expense of putting an electric sign on the roof of its office building which has called forth the warmest praise from the thousands of visitors, and has labored industriously to make the extra illumination features the best ever seen at a convention."

VENTILATION OF LUMINOUS AND FLAMING ARC LAMPS

Both the luminous or magnetite arc lamp and the flaming arc lamp give off considerable quantities of vapor, which has a tendency to condense on the cooler portions of the lamp and cause a



VENTILATED ARC-LAMP CASING

clogging of the mechanism and a deterioration of the insulation. These lamps should, therefore, be provided with a system of ventilation which will prevent these products from depositing on any part liable to be injured thereby and which will at the same time keep the magnet coils cool.

A few weeks ago a patent on an arc-lamp construction designed to accomplish these ends was granted to Richard Fleming of Lynn, Mass., and assigned by him to the General Electric Company. In this patent the construction of the arc mechanism was described at length, but the claims are devoted almost exclusively to the form of the casing surrounding the mechanism. The accompanying drawing shows this casing in relation to the essential parts of the mechanism.

The hood or top *1* is of the usual form and has a hollow post *2* extending downward from the center, to which it is rigidly secured. The lower end of the post supposts a disk-shaped horizontal platform *3*. Secured to the post are the solenoid coils, which are shown as differentially acting on the clutch that moves the upper electrode.

An annular member *13* having a flange *14* and a cylindrical portion *15* is carried below the platform *3* by posts *16*. The flange portion is parallel to the platform *3*. Secured to the flange is a support for the lower electrode of the lamp. This is preferably the negative electrode when the lamp is to be operated with direct current and contains or is formed of some material which yields a flaming or luminous arc, such, for instance, as the magnetic oxide of iron.

A casing *26* having its upper end secured to the hood surrounds the lamp mechanism. The casing comprises an inner cylinder *27*, which closely embraces the platform *3* and extends from a point adjacent the flange *14* to a point near the upper end of the casing, and an outer cylinder *28* concentric with the inner cylinder and which is separated therefrom by an annular space or chamber *29* that extends from a point near the upper end of the casing to a point about midway between the platform *3* and the flange portion *14*. Apertures *30* are formed in the portion of the inner cylinder immediately below the platform *3*. Apertures *31* are formed in the outer cylinder near its upper end.

Passages *32* extend through the casing. These passages may be formed by sections of pipe which extend through apertures formed in line with each other in the two cylinders; the ends of the pipe sections may be upset or turned outwardly, as shown, to lock the pipe sections in place and to make tight joints between the pipe sections and the two cylinders. A hood or water guard *34* is carried by the outer cylinder in such manner as to prevent the passage of moisture or dust into the interior of the inner cylinder.

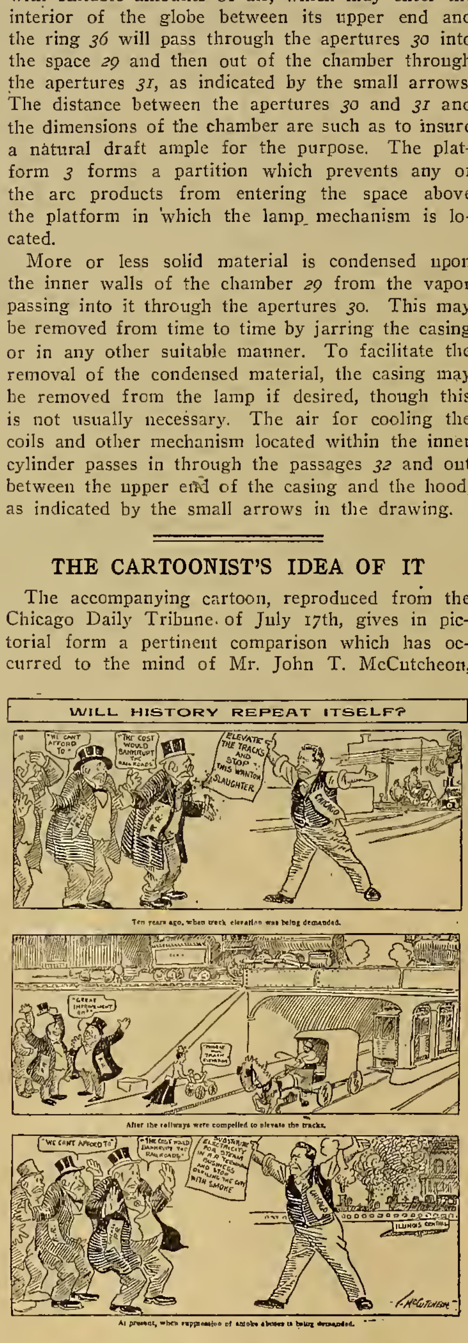
An annular hood *35* secured to the outer cylinder near its lower end supports an annular member *36* in any suitable manner, as by means of screws *37*. Member *36* supports in turn the globe which surrounds the lower portion of the lamp mechanism and protects or encloses the arc.

The gases or vapors produced by the arc, mixed with suitable amounts of air, which may enter the interior of the globe between its upper end and the ring *36* will pass through the apertures *30* into the space *29* and then out of the chamber through the apertures *31*, as indicated by the small arrows. The distance between the apertures *30* and *31* and the dimensions of the chamber are such as to insure a natural draft ample for the purpose. The platform *3* forms a partition which prevents any of the arc products from entering the space above the platform in which the lamp mechanism is located.

More or less solid material is condensed upon the inner walls of the chamber *29* from the vapor passing into it through the apertures *30*. This may be removed from time to time by jarring the casing or in any other suitable manner. To facilitate the removal of the condensed material, the casing may be removed from the lamp if desired, though this is not usually necessary. The air for cooling the coils and other mechanism located within the inner cylinder passes in through the passages *32* and out between the upper end of the casing and the hood, as indicated by the small arrows in the drawing.

THE CARTOONIST'S IDEA OF IT

The accompanying cartoon, reproduced from the Chicago Daily Tribune of July 17th, gives in pictorial form a pertinent comparison which has occurred to the mind of Mr. John T. McCutcheon,



the noted cartoonist. The railroads said they couldn't afford to elevate their tracks, but they were compelled to do so, and are now very well pleased with the change. A similar result will follow the electrification.

ELECTRIC STREET RAILWAYS AT MONTEREY, MEXICO

By W. D. Hornaday

This is an era of electrical development in Mexico. The application of electric power for the operation of the machinery of mines, mills and other industrial concerns is very general throughout the country. The transition of the motive power of the

DOUBLE-COMPARTMENT CAR IN MONTEREY, MEXICO

street-railway systems of the different cities of the country to that of electric has been slow. It was only a few years ago that the first electric street-railway line was opened for traffic in the City of Mexico, which has a population of 450,000 people. The town of Torreon, with a population of only 25,000 at the time, was ahead of any other place in Mexico in the establishing of an electric street-railway system. The city of Guadalajara, which is second in size to the City of Mexico, will soon have all of its street-railway lines equipped with electric power. Aguas Calientes has an electric car line that traverses the principal streets of the city. It will not be long until Chihuahua, Puebla, Pachuca, Vera Cruz and probably other cities of the republic will be similarly equipped.

It is in the city of Monterey that the most complete and modern electric system of street railway of any town in Mexico has just been finished, with the exception of one kilometer of track that is to be extended to industrial plants situated outside of the limits of the city. An interesting fact in connection with the electrical development of Mexico is that Canadian capital and Canadian people are in control of the two most extensive enterprises of that character—the one at Necaxa, which properly embraces the lighting and street-railway systems of the city of Mexico and Puebla as well as the furnishing of electric power for those two cities and the mining camp at El Oro and the other at Monterey. The Necaxa and Monterey financial interests and projects are separate and distinct, however, and the scenes of their operations are situated several hundred miles apart.

Monterey was long looked upon as an inviting field for an electric street-railway system. It is a city of more than 80,000 people and is the greatest industrial center and manufacturing town in Mexico. It has a larger American population than any other town in the country. The manufacturing plants give employment to many thousands of men. The governor and municipal authorities offered all possible encouragement to the construction of an electric street-railway line in the town and American promoters took hold of the project at various times, but nothing tangible was accomplished. The principal streets of the city were traversed by mule-car lines of the most antiquated pattern. It was known that the company which owned the larger of these two systems had been doing a profitable business for many years.

A little more than two years ago these two mule-car systems were purchased by William Mackenzie of Toronto on behalf of a syndicate of Canadians. Mr. Mackenzie obtained a concession from the government to convert the lines for electric operation and to make extensions of the system to suburban points and to occupy other streets of the city with new lines as occasion might demand. The track of the mule-car lines was narrow-gauge and the mules pulled the cars hitched tandem. Samuel Irvine was brought down from Toronto, Canada, and made superintendent. He knew the practical side of street-railway operation, and after many difficulties he was enabled to establish something of a system and schedule in the operation of the mule cars. Many new ideas had to be instilled into the minds of the Mexican employes. It took long and patient training to bring about the improvement to the service and to pave the way for the radical change that was to be wrought when electric cars were placed in operation.

The original mule-car lines purchased by Mr. Mackenzie covered practically the same territory as is now covered by the electrical lines of the Compania de Tranvias, Luz y Fuerza de Monterey, which, translated into English, reads the Monterey Railway, Light and Power Company. The two original mule-car systems consisted of 42,148 meters of narrow-gauge track. The Canadian concern began the work of replacing that part of these tracks situated within the city limits in January, 1907, and on April 1, 1908, all of the old track had been removed and replaced by a modern system designed for electric traction, consisting of 25,000 meters of main-line track within the city limits, 6,900 meters of main-line track outside of the city limits and about three kilometers of switches, curves and sidings.

Many difficulties and obstacles were encountered and had to be overcome in constructing the different lines comprising the system. The streets are exceedingly narrow, and the new track, which is of standard width, took up much room, impeding traffic while construction was in progress. The track gauge is the standard, 4 feet 8½ inches, and the rail used is 72-pound, T section, six inches high. The joints have six bolts and the rails are bonded with all-wire rail bonds having ⅞-inch terminals, being nine inches long.

In view of the fact that special work for the track would have to be transported such long distance, it was decided to bend all curves on the ground, making both rails of the section adopted and using a bolted-on guard rail on the inner side of the curve. It was very difficult, on account of the extremely narrow streets, to establish a standard system of curves and switch sets that would be simple enough so that it could be understood and the work executed by native labor. A system of compound curves, using a radius at the entrance of 100 feet and diminishing to the center radius in some instances to as low as 35 feet, and an entering radius of 50 feet, diminishing to the same minimum center radius, was finally adopted. The curves were so designed as to have chords of even foot-lengths over the compound entrances to facilitate the proper curving in the bending yard. By so doing, only two types of tongue switches were made necessary, namely, those having 50-foot radius and those having 100-foot radius. At the railroad crossings derailing devices are provided and all chances of accident at such places are reduced to a minimum.

The system is equipped for use of 550 volts direct current, and the overhead equipment consists of No. 000 groove trolley, hung with Ohio Brass Company's fittings through the entire system. A double-trolley circuit is hung over the suburban lines and a single trolley wire over the city lines. As in most instances, the track runs on the sides of the streets, the practice which is generally followed is to support the trolley wire with brackets. The poles in the city are round steel of the welded joint type and were furnished by a London, Eng., concern.

The passenger equipment at present consists of 25 cars, equipped with General Electric and Westinghouse motors. The 13 double-trunk cars have two compartments. The compartment in front is for the use of first-class passengers and the one behind for second-class passengers.

The generating plant consists of two generating units, one of which is of 300 kilowatts capacity, and the second, which is just being installed, of 400 kilowatts capacity. The generators are of the General Electric Company's make, direct-connected to cross-compound steam engines. Both units are being supplied with condensers, and a frame water tower will be used for cooling the condensing water.

The boiler equipment consists of three Atlas water-tube boilers of 300 horsepower nominal rating, especially adapted with large grate surface for burning Mexican coal. As shown by the accompanying illustration, the boiler room is roofed but not enclosed, owing to the climate.

The company obtains its water supply from the Monterey Waterworks and Sewer Company, which is an affiliated corporation. The power house building consists of steel frame work with steel roof trusses and brick walls. The roof over the engine room is of book tiling and over the boiler house it is corrugated iron.

The Excavation in Foreground Is for a Cooling Tower. It Will Be Noted that Boiler Room Is Not Enclosed.
POWER HOUSE FOR MONTEREY ELECTRIC RAILWAYS

The personal representative of Mr. Mackenzie and the other stockholders of the company on the scene while the construction was in progress was Lewis Lukes. To him is given the credit for the rapid progress of the work. F. H. Lancashire was the engineer in charge of construction from the beginning of the work until its completion. He is now the engineer and manager of the property. The other chief operating officers and employes are: Superintendent, Samuel Irvine; controller, E. R. Rust; master mechanic, Frank Page; station engineer, Tom Murray.

One of the electric-railway lines of the company runs to the suburban health and pleasure resort of Topo Chico Springs. The curative qualities of the hot waters of these springs for many kinds of ailments have long been known to the people of Mexico. The line does a heavy traffic carrying visitors to and from the place. It is distant about four miles from the city.

The conductors and motormen employed upon the different lines are Mexicans. Most of them saw service during the mule-car regime. They were given careful training before placed in charge of the electric cars and are rapidly becoming proficient in the discharge of their duties. The ignorant class of people in Monterey are gradually being made aware of the fact that the momentum of the electric cars is greater than that of the old mule cars. One of the chief annoyances which the company has to contend with is the habit which many of the passengers have of jumping off the cars at any place along the street where they may desire to alight without waiting for the car to stop. As a result of this practice there have been a number of accidents.

Governor Bernardo Reyes of the state of Nuevo Leon, of which Monterey is the capital, and the municipal authorities gave the company their assistance in many things in the construction of the system.

CHICAGO TRACTION REHABILITATION

A report showing the work of rehabilitating the Chicago Railways Company's street-car lines, prepared by John M. Roach, president of the company, shows that 56 miles of new track has been laid under the new ordinances.

The report was substantially as follows:

"Under the new ordinance we constructed in 1907 20.428 miles of new track. This track was constructed in accordance with the specifications of the ordinance, using the 120-pound grooved rail and No. 1 granite block.

"During the present year, 1908, we have already constructed, or now have under construction, 36.302 miles of new track and about 90 miles of underground ducts.

"Our plans at the beginning of this year contemplated the construction of something over 65 miles of single track, and up to July 1st we kept to our schedule for the accomplishment of this work, but the inability to get granite now seems likely to cut down the season's mileage. We have contracts covering sufficient granite, but are unable to get it as fast as our plans called for, and it does not seem likely that the situation will be improved this year.

"Six hundred and fifty 'pay-as-you-enter' cars will be added to the system during 1908 and the early part of 1909. Six hundred of these cars are of wood construction and 50 are of steel. These cars are to be of the best type."

The company is rebuilding or will have rebuilt during the year five of its car barns. Three of these are substantially new structures and the others are being enlarged and remodeled to accommodate the new double-truck cars. The new buildings are of fireproof construction. The car shops of the company have also been enlarged and some of the departments entirely rebuilt.

On the South Side the Chicago City Railway Company has constructed so far this year about 28 miles of track. The ordinance required the reconstruction of 35 miles of cable lines and 60 miles of electric lines during the rehabilitation period of three years from the date of its passage in February, 1907. More than half this work has been completed already. Of late, however, the difficulty in obtaining the proper granite blocks has necessitated cutting the reconstruction force.

The company now has all the new cars required by the ordinance. Two new car barns have been built this year and two others are contracted for. There has been expended by both companies so far nearly $20,000,000 for the rehabilitation work.

THREE-CENT FARES IN CLEVELAND

The city of Cleveland will have a straight three-cent fare with universal transfers starting July 28th, but only on trial. It is declared that this plan is likely to prove a failure, in which event, after a reasonable period of time, the charge of one cent for each transfer will be resumed unless the public prefers a four-cent fare, with universal transfers, or some other fare. President A. B. du Pont said that the Municipal Traction Company is ready to "go back to any fare it is entitled to charge before permitting the property to go back to the old company." In a formal statement made on July 16th he outlined the necessity for a penny transfer charge and asserted that deficits in the May and June reports are due to the strike and dull times. He also said he expected the company to lose money during the first year, but believed that the three-cent fare will pay in time.

PROPOSED PLATINUM MONOPOLY

The Russian Ministry of Finance has proposed a new state monopoly on platinum. Most of the seven tons of the metal produced annually in Russia is worked in the United States and Germany.

The present high price of platinum, which now stands considerably above that of gold, will be almost doubled if the proposed monopoly is created. Such an increase in the price of platinum will be a serious consideration for the manufacturers of incandescent lamps, telephone switchboards and other small contact parts.

ELECTRICAL DETECTION OF DANGEROUS GASES

Another application of the selenium cell that is of considerable scientific and practical interest has been invented by Heinrich Freise of Bochum, Germany, and recently patented in the United States. The invention consists of a method and appropriate apparatus for electrically detecting any dangerous opaque or transparent gases and of actuating alarm devices, and, if so preferred, also other devices for removing the danger.

A source of light, a selenium cell and a device for projecting rays of light from this source to the cell are employed. There is also provided a primary circuit, including the selenium cell, so that normally the resistance of the latter is reduced and a current of sufficient strength circulates in the primary circuit. The dangerous gas is passed across the rays of light, and if it is opaque it will at once darken the selenium cell, so that its resistance will increase and the strength of the current in the primary circuit will decrease. An electromagnet is inserted in this circuit, so that it is normally energized and attracting its armature. A secondary circuit is adapted to be closed by this armature when released, and it includes an electric alarm. If actually dangerous opaque gas (such as smoke, for example) is for some reason formed

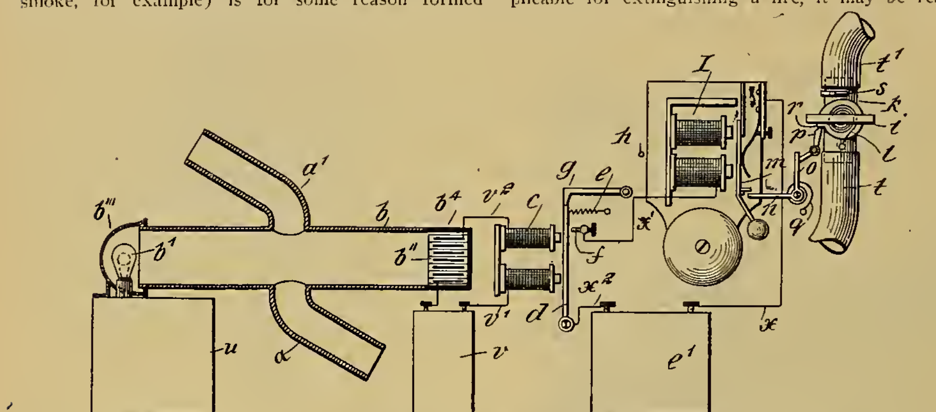


FIG. 1. APPARATUS FOR DETECTING SMOKE OR OPAQUE DANGEROUS GASES.

and passes across the rays of light, it will darken the selenium cell, release the armature, which is detached by a spring, and closes the secondary circuit, and thereupon the alarm will sound.

If the dangerous gas is transparent, such as foul gases in a colliery or the like, there may be provided means for passing a transparent band impregnated with suitable chemicals through the current of gas between the device for projecting rays of light and the selenium cell. These chemicals are of such a kind as to render the band under the action of the gas more or less opaque, so that the same effect as described above is obtained. Or there may be provided means for chemically rendering the dangerous transparent gas more or less opaque, when the same effect will be attained.

The accompanying drawings will make clear the details of the apparatus. In Fig. 1 is shown an apparatus for electrically detecting smoke or the like in a room or building. A source of energy u supplies an incandescent lamp b^1 with current. A primary circuit v^1 v^2 is provided, which includes a source of current v (for example, a battery), a selenium cell b'' and an electromagnet c. The selenium cell is shown as disposed within a box b^4 and exposed to the rays of light emanating from the incandescent lamp through a convenient tube. A reflector b''' is arranged for deflecting the rays of light to the selenium cell. The tube b is connected with two opposite tubes a and a', which are so bent as to permit no foreign light to enter tube b. The two opposite tubes are preferably so disposed, that any smoke produced on the place from any cause can easily pass through them upward while crossing or intercepting the rays of light that pass from the lamp to the selenium cell.

A secondary circuit x, x^1, x^2 is provided, which is shown as comprising a source of current e^1, the armature d of electromagnet c, an adjustable stop f and an electric alarm I. The armature is normally attracted by the electromagnet and is arranged to be detached and pressed on the adjustable stop by a spring e when the electromagnet becomes too weak. A hook g may be provided, which normally rests on the end of the armature d and is adapted to snap behind the latter when detached and to press it on the stop and cause the alarm to sound continuously.

Where so preferred, a further device may be placed under the control of the secondary circuit. For example, a sprinkler system may be disposed in the room or building for extinguishing a fire. Of this pipe system only a tube t with a water cock k and a supply tube t^1 is shown in Fig. 1. A spring l is provided for pressing the handle on the plug of the water cock against a suitable stop s and thus maintaining the cock in its open state. A bent lever p engages with its upper arm a tooth r on a cam disk fastened on the plug of the cock. The handle can then be turned through an angle of 90 degrees while straining the spring l until the lever p snaps behind the tooth r and holds the plug in its closed position. Another bent lever n o is provided and a spring q presses its horizontal arm n on an insulated stop disposed on the spring-pressed armature m of the bell, while the upper vertical arm o merely leans against the lower arm of the bent lever p.

From the foregoing the operation of the apparatus can be readily understood. Smoke, as from a fire, rings the alarm and this opens the water cock. While the apparatus here described is applicable for extinguishing a fire, it may be readily modified for the detection of any opaque dangerous gas besides smoke.

In case no smoke but a dangerous transparent gas, such as foul gas in a colliery, is to be detected, a band w impregnated with a suitable chemical may be passed across the tube b at the place where the curved tubes a and a^1 cross the tube b, as is shown at Fig. 2. The band is shown as passing upward from a roll w^1 to another roll w^2 over suitable guiding rollers y, y^1. A box z is shown as attached to the tube and enclosing the lower roll w^1. It is filled with a liquid chemical. It is essential that the band impregnated with the chemical shall remain transparent as long as everything is all right in the room, but become dark the moment that the dangerous transparent gas

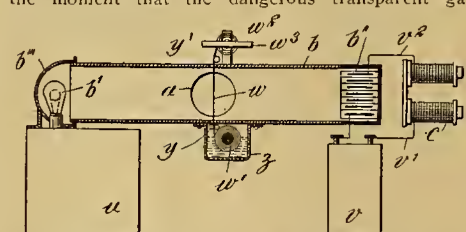


FIG. 2. APPARATUS FOR DETECTING DANGEROUS TRANSPARENT GASES.

passing through the tubes a and a^1 and across tube b acts upon the chemical in the band.

The band may be moved, for example, by a clockwork arranged for unwinding it from the lower roll and for winding it on the upper roll, and mechanism may be provided for reversing the motion of the two rolls from time to time, and thus keeping the band moving. Or the band may be simply shifted by hand, as by means of a handle w^3 on the upper roll, so as to remove its portion acted upon by the dangerous transparent gas and rendered more or less opaque from the interior of the tube, and to expose a fresh transparent portion to the rays of light passing from the lamp to the selenium cell.

The liquid chemical in the box z may be, for

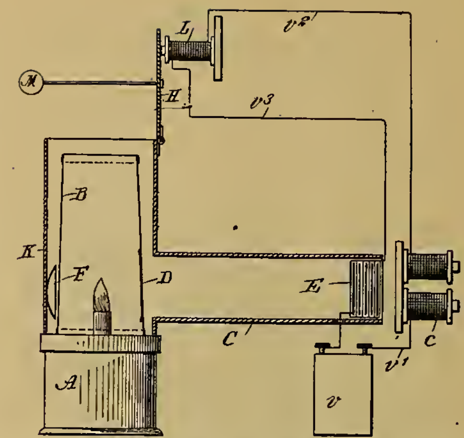


FIG. 3. APPARATUS FOR DETECTING CARBON MONOXIDE AND FIRE DAMP.

example, a solution of palladium chloride, which has the property of blackening linen impregnated with it, if dangerous transparent gases, such as carbonic oxide, carbonic acid, illuminating gas, methane, ethylene, or the like, pass across the tube and act upon the linen on both sides. A mixture of a solution of ammoniacal cuprous chloride with a solution of sodium-palladium chloride impregnating the linen band has the property of forming a weak cloud of finely distributed palladium in the presence of carbonic oxide. It is obvious, that such chemicals coloring the band under the action of dangerous transparent gases will produce much the same effect as the smoke in the manner described above. From Fig. 2 parts have been omitted that are shown in Fig. 1, but it is evident that these parts may be employed with the apparatus shown in Fig. 2 as well, or, at any rate, a secondary circuit with suitable devices for warning or other purposes must be provided.

Instead of impregnating a band of linen or the like with chemicals and exposing it to the action of dangerous transparent gases for operating the apparatus, these gases may be chemically treated for actuating a suitable apparatus. For example, such transparent gases may be rendered more or less opaque by combustion. A suitable apparatus serving this purpose is illustrated in Fig. 3. A lamp A similar to a miner's safety lamp is employed, which may comprise a mantle K with a tube C, a wire basket B with a window D in front of the tube, a reflector F and a cover H for closing the upper opening of the mantle. At the end of the tube a selenium cell E is disposed, which is inserted in a primary circuit v^1, v^2, v^3, including a battery v and two electromagnets c and L. The electromagnet c is the same as that shown in Figs. 1 and 2 and is arranged to release its armature for closing a secondary circuit (not shown). The cover may be pressed downward by a suitable weight M and is normally attracted by the electromagnet L for permitting the lamp to burn. Air is admitted from below to the lamp A in a similar manner as in a miner's safety lamp. The flame of the lamp will emit rays of light through the window D and the tube to the selenium cell for reducing its resistance. This pencil of rays of light will be strengthened by the reflector F. A suitable filter may be provided for keeping off any coal dust from the lamp. When fire-damp or carbonic oxide passes through the lamp, it will burn with a blue flame, whereby the selenium cell will be darkened, so that the strength of the current in the primary circuit will be reduced. In consequence of this the electromagnet L will release the cover, which drops and closes the top opening, thus extinguishing the lamp, and the other electromagnet c will release its armature for closing the secondary circuit and thereby actuating the alarm or other devices.

DECREASE IN RAILROAD ACCIDENTS

For the quarter ended March 31, 1908, the Interstate Commerce Commission reports a total of 728 persons killed and 14,713 injured in casualties to passengers and employes on all the railroads of the country. These figures are a decided decrease from the usual numbers afflicted by railroad accidents in corresponding periods during the last few years. The commission attributes a great deal of this to the decrease in volume of business handled by the roads.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION

The eighth annual convention of the National Electrical Contractors' Association was held in Chicago on July 15th, 16th and 17th, and the contractors and their guests spent the three days in interesting business sessions and in enjoying the pleasant entertainment features planned by the local committee. The meetings were held in the convention hall on the sixth floor of the Auditorium Hotel. James R. Strong of New York, the retiring president, was in the chair, and Secretary W. H. Morton, Treasurer J. R. Galloway and other officers were also present.

The programme for the first day's open session included an address of welcome by Henry Newgard, president of the Illinois Electrical Contractors' Association, and the following papers:

"The Electrical Contractor's Opportunities in the Illuminating Field," by George Loring of Cleveland, engineer of the National Electric Lamp Association.

"The Relations Between the Underwriters and the Contractors," by W. H. Merrill, Jr., of the Underwriters' Laboratories, Chicago.

Both papers were well received, and discussion by the members of the audience followed. A brief résumé of each paper was given in the issue of the Western Electrician of last week, which contained a report of the first day's proceedings.

The afternoon was given over to an executive business session of the contractors themselves. At seven o'clock in the evening the members of the convention and their guests sat down to a well-appointed banquet in the great banquet hall of the Auditorium Annex. The electrified version of the menu (which readers of the Western Electrician may interpret at their leisure) is given below:

Specification.

Auto Starter
Iced Guttapercha Tablets
Battery Solution
Extras
Fish Work
Letter Nailheads
Insulating Compound
Zincs
Fan Motors
Fat Contractor
Time and Material Work
Jobber
Permits Inspection
Final Certificate
Vaudeville Manila Rope

The ladies of the convention and their guests were served in an adjoining hall, and after the men lighted their cigars, joined the gentlemen's party in the balcony of the large banquet hall. One end of the room was cleared and a very creditable vaudeville performance, sprinkled with some local hits, was given.

The banquet committee, to which the company owed thanks for a delightful evening's entertainment, was headed by Ernest Freeman, chairman, and comprised Charles R. Kreider, Henry Newgard, Warren Orne and Arthur Frantzen.

Illuminating Engineering.

The programme for the open session of Thursday morning opened with a paper on "Illuminating Engineering," by J. R. Cravath, Chicago.

Mr. Cravath explained some of the latest and most simplified methods of attacking modern illuminating problems, describing the uses of various light sources and reflectors and the effect of walls and ceilings on the results obtained. The definition of efficiency, it was pointed out, is difficult on account of the many elements involved. Besides the simple luminous efficiency of the lamp, there must also be considered its arrangement for comfort and satisfaction to the eye and accord with the sense of beauty. In general, Mr. Cravath announced, about 25 per cent. to 35 per cent. of the available light should be thrown on the walls and ceiling and reflected from there, while the remaining 75 to 65 per cent. reaches the illuminated surface directly. In comparing the opal and the prismatic reflectors, the speaker found little difference in the advantages presented, for while the prismatic type is slightly more efficient the diffusion with it is perhaps not so great.

By the aid of sketches Mr. Cravath illustrated the part played by the walls in reflecting light to the working surface. As a "horrible example" of lighting by exposing the lamps in the line of vision, a number of electric lights at the front of the hall, which had been installed in the original lighting plan of the building more than 15 years before, had been allowed to remain lighted, and when these were extinguished the consequent sense of relief to the members of the convention carried a convincing lesson. For efficient operation, the speaker said, indirect lighting plans should never contemplate more than one reflection from the lamp to the working surface. Indirect systems are inherently expensive, but often much more comfortable than direct illumination.

A simple method was given for computing the total required watts for lighting a given floor area to any desired intensity of illumination. An average intensity was placed at three foot-candles, although this quantity may reach as high a value as 10 foot-candles in the case of a drafting room or special illumination.

In answer to questions, Mr. Cravath explained how, by the selection of suitable reflectors, little difference in the results follows change in the height of the lamps above the working surface.

ELECTRICAL CONTRACTORS AND THEIR GUESTS ON STEAMSHIP RETURNING FROM MICHIGAN CITY.

The Central Station and the Contractor.

"The Relations Between the Lighting Company and the Contractor" was the subject of Alex Dow, general manager of the Detroit Edison Illuminating Company. Mr. Dow spoke interestingly and without notes. The speaker first directed attention to the difficulty of distinguishing between the functions of the contractor and the lighting company under certain conditions. He described the different classes of contractors from the small-scale artisan to the large concern, undertaking the complete installation of even lighting companies' central stations. Beginning with some reminiscences of the early days, brightened by surprising stories of early construction, Mr. Dow explained the need that often exists for the central-station company itself to undertake the wiring of houses and other work, which he admitted was usually more satisfactorily performed by outside contractors.

But in small places the central station must, out of the sheer necessity of securing its own income, be prepared to install service. Often the total amount of business done is too small to make it worth the time of a contractor in the place, while the business equipment of the lighting company can easily perform the additional task of caring for construction work. However, Mr. Dow explained his own conviction that entire separation of central-station and contracting work was the more satisfactory plan, and he advised the transfer of the construction work to outside contractors at the earliest possible period in the growth of the central-station business. Credit for new business, he believes, belongs to the man who hustles for the contract.

The Contracting Business.

Seth B. Weatherbee of Boston closed the programme of the open session with a paper on "The National Electrical Contractors' Association."

Beginning with the history of the organization, Mr. Weatherbee told of its acceptance of the National Electrical Code rules and its efforts toward adoption of a uniform set of wiring symbols finally achieved in collaboration with the National Association of Architects. In treating of the modern tendencies in electrical work, the speaker deplored the sale of goods over the counter by the jobber to irresponsible persons, as well as the dispensing of electrical supplies at almost wholesale prices. He believes the jobber should respect the rights of the contractor, even if he fails to appreciate the pernicious results of furnishing electrical supplies to ignorant persons, with the consequent fire risk from faulty and uninspected installation.

Mr. Weatherbee, who, beneath a calm exterior, possesses a fund of humor and sarcasm, paid an eloquent tribute to the versatile individual, the "handy man" who repairs the elevator, fires the boilers and installs electrical wires with equal facility. He also paid his respects to the bright young man of the family, who, having made the door-bell work, undertakes the more serious task of attaching electric-light fixtures. All of these results proceed from the ease and cheapness with which electrical supplies may be purchased by the irresponsible and ignorant, and the speaker proposed the licensing of all contractors. It is probable that a bill will be framed for introduction into the various state legislatures covering the points raised in his talk.

Jovianism.

C. E. Robertson of Buffalo, N. Y., high in the councils of the Sons of Jove, the national electrical trade fraternity, closed Thursday morning's session with a talk on the aims and purposes of Jovianism. Bonded together in brotherhood and good-fellowship, this order, which includes all of the divisions of electrical interests as eligible for membership, seeks to insure honest discussion and square dealing between all members of the electrical business. Mr. Robertson's talk was loudly applauded.

Events of Thursday Afternoon.

Thursday afternoon was given over to an executive business session by the contractors, while their men guests were put aboard automobiles and taken to the National League ball park to witness the baseball game, in which the New York "Giants" defeated the Chicago "Cubs." The ladies of the convention spent the afternoon enjoying an automobile ride through the parks and boulevards of the South Side.

Election of Officers.

The business session lasted until late, and the following-named officers were elected for the coming year:

President—G. M. Sanborn, Indianapolis.
First vice-president—M. L. Barnes, Troy, N. Y.
Second vice-president—Charles R. Kreider, Chicago.
Third vice-president—H. S. Potter, Boston.
Treasurer—John R. Galloway, Washington, D. C.
Secretary—W. H. Morton, Utica, N. Y.
Sergeant-at-arms—J. C. Sterns, Buffalo.

Closing Entertainment Features.

On Thursday evening the men attended the rejuvenation of the Sons of Jove, while the ladies

[*Continued on page 66.*]

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

INSPECTION of the tailrace tunnel of the great hydro-electric plant of the Niagara Falls Power Company on the American side of the river, made possible by recent shutdowns, reveals the gratifying fact that practically no damage has been done to the original tunnel as the result of continuous use for 13 years. This indicates not only the substantial character of the masonry construction of the tunnel but also the correctness of the design and will be encouraging to owners of other plants of similar character.

Defects were found in a more recent extension of the tunnel, due to the impact of blocks of ice, arrangements having been made to discharge the ice from the intake canal through two shafts into this tunnel extension. The floor of the extension under the ice shafts was covered with iron and thus well protected, but it seems that the roof of the tunnel was injured by the rebounding of the ice or its buoyant force. This had not been anticipated, although a year after the construction of one of the ice shafts a buffer of steel beams was built near the bottom of it, against which the cakes of ice are shattered before entering the tunnel. It has not been found necessary to use the second ice shaft since the first was equipped with the buffer. It is believed that the injuries done by the ice to the roof of the tunnel date back to the first year of operation of the ice shafts and that the cause no longer exists. Nevertheless, repairs will be made at once.

The facts revealed are important and interesting. Danger from ice is one against which all managers of hydro-electric plants in this latitude must guard in winter. The experience at Niagara has of course to do with a very large plant, impressive in all its dimensions; but where ice is discharged through tunnels—a course apparently to be avoided if practicable—it is shown that, unless the ice is broken into small fragments, protection must be provided at the top of the tunnel, near the shaft, from the rebounding or buoyancy of the cakes of ice.

THE FOREST SERVICE of the United States government notes with dismay that about 200,000 acres of virgin forest in West Virginia has been sold to a company which proposes to cut off the valuable hardwoods. The land lies in a mountainous region drained by northeastern tributaries of the Great Kanawha, which empties into the Ohio about 300 miles from Pittsburg. It is one of the largest and most valuable bodies of hardwood timber remaining in the Appalachian region. Many of the mountain ranges which crosses the tract are from 3,000 to 4,000 feet high and covered to their summits with rich forests. North of this tract but drained by the same stream lies another holding of 129,000 acres, recently secured by a pulp company. This is covered with spruce and hemlock, with many patches of hardwoods. Development of the property, it is said, will begin soon. The two bodies of land, lying in the same region, aggregate more than 500 square miles of primeval forest about to be turned into marketable products.

It is pointed out that the stripping of the forest cover from a region so large and so mountainous will be watched with interest by those who study the effect of the soil cover on stream flow. The rainfall over the region is very heavy—more than four feet annually. Snow six feet deep on the timbered mountains, while not usual, is an occasional occurrence. Fire is pretty sure to follow the usual methods of lumbering, and unless this region is more fortunate than most lumbered tracts in that part of the Appalachian plateau, many of the summits and sides of the mountains will be laid bare down to the soil and rocks. The rainfall and melted snow, which are now retarded by the forests, will then pour down the naked slopes and cause destructive floods in the lower streams, and low water will follow.

West Virginia is one of the states which has taken no measures to protect its valleys from floods by preserving the forests on the mountains. Its woods are being cut and burned more rapidly, perhaps, than those of any other state, according to the Forest Service, and this in face of the fact that it is by nature a forest state, with soils and situations suited to almost all eastern timber trees. "It might perpetuate its forests and have woods of immense value always. A little protection against fire, the leaving of small trees to form the future forest and provision for reproduction by means of seed trees are simple measures, but they would mean all the difference between wasted hillsides and well-stocked forests ripe for the ax. A few years would bring handsome returns from the investment."

Generous support should be extended to the foresters of the United States government in their intelligent and patriotic work of conserving natural resources and sensibly husbanding the timber supply of the country. As an economic proposition the movement for forest cultivation rather than forest destruction is undoubtedly sound, while it also appeals to every lover of nature and every man with a healthy out-of-doors spirit. Those interested in hydro-electric developments should also favor the movement from the relation of standing forests and stream flow.

MUNICIPAL OWNERSHIP of electric-lighting plants is not favored by a disinterested committee recently appointed by the Civic League of St. Louis to consider the subject. This committee was made up of engineers, lawyers and business men, and its investigation was thorough and lasted over a year. In its report, recently submitted, the committee finds that the total cost of operating a municipal plant, if operated in a businesslike manner, would be approximately 2½ cents per kilowatt-hour, or about $69 per arc lamp per year, and about $17 per incandescent lamp per year. "But the danger of partisan politics in the management and operation of the plant, which tends to reduce its efficiency and increase its cost, indicates the inadvisability of municipal ownership except as a last resort." And further: "In the opinion of the committee the conditions at the present time are unfavorable for the construction and operation of a municipal electric-lighting plant for the lighting of the streets of the city; and it believes this function should not be undertaken by the municipality if reasonable rates and efficient service can be secured from private companies. However, the city should reserve the right to construct its own plant."

This conclusion is distinguished by good sense. It is shown, further, that the chief items entering into the cost of producing electric street lights in a municipal plant are operating cost, depreciation, interest on investment, sinking fund, taxes and insurance.

Operating cost covers not only the cost of generation but of distribution, and includes such items as fuel, water, oil, wages, salaries, rent, maintenance, repairs, etc. Salaries should include a proportionate share of the expense of whatever departments of the city government are charged with any portion of the management of the plant. If the accounts are kept by the controller's department, then a fair proportion of the expense of that office should be charged to operating expenses. If the plant occupies a part of a public building used for other purposes, then a fair proportion of the rent of that building should be charged to operating expenses. In short, whatever supplies or services the electric plant received from any other department of the city government should be included in the expense of operation.

As to depreciation, the committee's observations are also excellent. It is pointed out that depreciation must be considered on apparatus, building, lines, lamps and everything which has to do with the production and distribution of electricity, with the exception of the land on which the building is located. The question of depreciation is one on which there is always a great variety of opinion. If it were merely the question of duplicating worn-out machinery the percentage of depreciation could easily be estimated, but in the electrical business it is not the simple wearing out of the machinery that causes depreciation. It is the progress of the art of electric lighting and the rapid changes which are constantly being made in electrical devices and equipment. So rapid has this progress been that what was modern equipment 10 years ago is now largely scrap. Scarcely a piece of machinery 10 years old but what must be discarded in favor of a more efficient and economical substitute.

The committee of the Civic League is to be congratulated on the wisdom and fairness of its report.

CHICAGO FIRE-ALARM SYSTEM

The transfer of the fire-alarm office of the city of Chicago from the old City Hall, soon to be demolished, to temporary headquarters in the Hamilton National Bank Building, 82 La Salle Street, was accomplished last week. Under the direction of City Electrician Carroll a duplicate of the present office has been installed in the new quarters and for a time the fire-alarm system will be operated in both offices.

The Chicago system, which has been adopted in most of the larger cities, is the result of the work of John P. Barrett, E. B. Chandler, Edward B. Ellicott and William Carroll, the present city electrician. Mr. Carroll has been in harness for 34 years; Harry Leser for 32 years; Jacob Mehren, 30 years, and Frank Swenie, 28 years. Mr. Swenie is the son of the late fire chief, Denis Swenie.

Great care is taken to insure the operation of the fire-alarm signals, and to this end much of the apparatus is duplicated. The process of distributing an alarm is explained as follows:

The alarm from a street box comes over a single wire to the central office, where it is received on a sounder and recorded on a tape.

Instantly the operator transmits it to every engine house, the alarm being repeated four times, twice on duplicate wires. This is to provide against the possibility of one wire being down or otherwise out of service.

At the engine house the alarm is registered on a tape and sounded on a "tapper"—a small gong in a glass case.

A man detailed to watch the instruments notes whether his company is to respond to the alarm. If it is he presses a button, which releases the horses and sounds a larger gong to warn the men.

If the alarm is not in his district he presses another button, which stops all noise, and, if at night, allows the men to continue their slumbers. On the other hand, if the instrument man should not be at his post, the alarm would go on and the men awakened from the central office, thereby disclosing the sentinel's failure to attend to his duty. This is called the "joker" system.

Every engine house also is equipped with a telegraph instrument and a telephone.

The striking of bells as public fire alarms was abandoned at the time of the anarchist troubles in Chicago twenty years ago. It was feared that by arrangement a signal for a general uprising might be spread throughout the city by the simple "pulling" of a fire-alarm box. Another reason was that the bells tended to increase the crowds at fires.

CHICAGO AND SANITARY DISTRICT AGREE ON WIRES

By an order passed by the City Council of Chicago on July 17th the controversy between the city and the Sanitary District in regard to the erection of poles and wires by the latter within the city limits was finally closed.

This order directs the commissioner of public works to issue to the Drainage Board the necessary permits for wires and conduits subject to the following conditions, among others of minor importance:

All applications must be approved as to form by the city electrician.

All permits must contain such restrictions as to location of poles and so on as are required by the commissioner of public works.

The Sanitary District must give a bond to indemnify the city against all claims for damages, to guarantee the restoration of all streets torn up, and to insure the removal of all poles and conduits in case the courts decide frontage consents were necessary before they were installed.

The district binds itself to restore promptly any street or alley pavement which it may have to tear up.

The permits are to be issued on the understanding that neither the district nor the city waives any of the rights it now claims.

The agreement between the district and the city was the result of conferences between President Robert R. McCormick of the Drainage Board and Mayor Busse, and is declared to be satisfactory on all sides. It leaves the courts to decide the vexed question whether the Drainage Board must obtain frontage consents before making its connections for its customers, and until they do so decide the board can go ahead without them.

ICE DAMAGE IN NIAGARA FALLS POWER-PLANT TUNNEL

On Sunday, July 19th, the Niagara Falls Power Company shut down its two big generating plants in Niagara Falls, N. Y., in order that it might make needed repairs to the tunnel tail-race that carries the water from the wheelpits to the lower river. It will be remembered that a few weeks ago the water was shut out of the tunnel in order that it might be inspected. General Manager Philip P. Barton now states that the official report made by the company's engineers at that time confirms the reports made of the conditions found. In both wheelpits and throughout the entire length of the main tunnel between wheelpit No. 1 and the tunnel outlet in the lower river, a distance of about one and one-third miles, the engineers tell that not a brick was displaced, and no sign of material erosion was visible other than the rounding of the edges of an occasional brick projecting a small fraction of an inch beyond the surrounding surface of the wall, so that after 13 years of continuous use the masonry lining is now in substantially the same condition as when the tunnel was completed.

In 1902 an extension of the tunnel to take the discharge from wheelpit No. 2 was completed, and two shafts were constructed for the purpose of discharging the ice from the intake canal directly into the tunnel extension. The recent inspection showed that in two places in this extension the roof has been injured. The defects are immediately adjacent to the two ice shafts and downstream from them. This damage is attributed by the power company's engineers to the impact of heavy blocks of ice discharged from the canal through the two shafts. The floor of the tunnel extension beneath each of these shafts is paved with heavy iron blocks that have proven entirely adequate to serve the intended purpose of resisting, so far as the floor of the tunnel is concerned, the blow of falling ice. The projection upward of the heavy pieces of ice with buoyant force sufficient to injure the roof structure was not anticipated at the time of the construction of the tunnel extension and ice shafts. In the summer of 1903, however, a substantial buffer of steel beams was placed just above the tunnel roof at the bottom of the ice shaft at the north end of the canal near power house No. 1. Cakes of ice must now strike upon this buffer and are completely shattered before entering the tunnel. The same construction is possible in the other ice shaft, but has not been placed there because, since the winter of 1903-04, it has been found unnecessary to discharge large cakes of ice through that particular shaft, and such use of the shaft is not expected to be necessary in the future.

The appearance of the tunnel extension confirmed the judgment of the engineers that the injuries were done several years ago and that the cause of them no longer exists. The fact that the tunnel extension has been operated continuously for years under present conditions evidently indicates that it might be operated safely for an indefinite further period. A decision, however, has been made by the company to make repairs at once, owing chiefly to the fact that such repairs necessitate some reduction in the load of the power plant, and that the company's customers are better able during the present month to arrange for such reduction in their power use than they will be later, when an increased demand for their products is expected.

While the work is in progress the needs of all local customers who might be seriously inconvenienced by a shortage of power will be taken care of by the plant of the Canadian Niagara Power Company, which plant also will supply a considerable share of the long-distance load. The remainder of the long-distance load will be carried by the plant of the Electrical Development Company of Ontario, with which company arrangements have been made for that purpose. None of the public services, such as lighting and street-railway service, will be interfered with in the least.

It is expected that the complete shut-off of the water will extend over only a brief period, at the expiration of which time one of the two power houses can be operated to its full capacity, and that the full load of the plant can be resumed within a week or 10 days from the time work is begun.

During the period of the tunnel shut-off, the International Railway Company will seize the opportunity afforded to repair the damaged American abutment of the upper steel arch bridge, which structure it owns. A force of men will work night and day in the construction of a concrete wall to replace the protecting wall injured by the wash of the tunnel stream. Of itself, this will be quite an undertaking, as it calls for quick, rapid, sure work.

USE OF "WIRELESS" BY BRITISH NAVY

Probably the most extensive use of radio-telegraphy in directing naval operations was begun on July 16th at the opening of the annual war maneuvers of the monster British fleet of 315 warships in the North Sea. From the offices of the Admiralty Board in London, 400 miles away, the movements of the greatest armada ever gathered together in the world were directed by wireless telegraphy.

This use of wireless communication made during the defense of the seacoast of England against the attacking fleet marks what is believed to be its greatest achievement in naval application. The Admiralty Board controlled the movements of the defending fleet, using a code unintelligible to the enemy. Communication was rapid and accurate, it is said.

Messages were sent daily from the Admiralty not only to ships of the North Sea armada but to the Mediterranean fleet at Gibraltar and to other points.

"WIRELESS" PROPOSED FOR HOTELS

James Woods, manager of the St. Francis Hotel of San Francisco, is much impressed with the possibilities of the proposition to have wireless-telegraph stations in the leading hotels in a chain of the principal cities of the United States. He says that he will proceed to install a station without delay. Plans have been under consideration for some time, it is asserted, for the establishment of a transcontinental wireless service between New York, Philadelphia, Buffalo, Chicago, Denver and other cities until San Francisco is reached. Manager Maresch of the Bellevue-Stratford Hotel, in Philadelphia, and George Boldt, manager of the Waldorf-Astoria, in New York, are the original promoters of the project. They say that one important feature of the proposed service will be the facility with which travelers can engage rooms in hotels before their arrival and even before leaving the ocean steamers in which they may be traveling.

THE COLOR OF LIGHTNING

An English observer read a paper recently before the Royal Meteorological Society on "Observations on the Color of Lightning made at Epsom 1903 to 1907." For the last five years the writer had kept a record of the colors or series of colors noted during each thunderstorm or display of sheet lightning, and tabulated them under their respective colors. He had thus results of observations of fork lightning made during 57 thunderstorms and 78 observations of sheet lightning. It appears that in fork lightning red is the color of the most frequent occurrence, and this is followed closely by blue, the least frequent colors being orange and green. White is of the greatest frequence in sheet lightning, red and yellow being next. It seems that the presence of hail, when occurring in association with a thunderstorm, is intimately connected with blue lightning.

ELECTRIC POWER FROM IRRIGATION PROJECT

Electric power generated by water from the Truckee-Carson irrigation project is being used to light Fallon, Nev., the seat of Churchill County. The generators are running day and night at the gates of the canals from the Carson River, a few miles west of the town. The water right is held jointly by the government and a local corporation, $75,000 having been paid for it. So far as known by the management, this plant is the largest ever constructed on an irrigation system. A few days' test of the generators has proven that enough water is available to furnish power for industrial projects, and eventually it is planned to string wires into Fairview and Wonder.

CONTROVERSY OVER OVERHEAD EQUIPMENT OF NEW YORK CENTRAL

Except for the investigation of the surface railways in New York city, the most important case, judging from the voluminous testimony to come before the Public Service Commission of the First District of New York, is that practically concluded at the hearing of July 16th, with regard to the demands of the city of New York that the New York Central and Hudson River Railroad Company be compelled to place underground its high-tension aerial transmission lines within the limits of the city.

The controversy between the city and the railroad is of several years' standing, dating back to the application of August 24, 1905, made by the New York Central road to the commissioner of water supply, gas and electricity of the city, asking for permission, among other things, to cross with aerial transmission lines the streets intersecting the Hudson, Harlem and Putnam divisions of the New York Central Railroad within the city limits. The department referred the application to the corporation counsel's office for an opinion, on receipt of which the department notified the New York Central Railroad to make application in accordance with the opinion of the corporation counsel. The attorney for the railroad replied, differing from the opinion of the corporation counsel and stating in effect that the railroad company was not required to apply to the department for right to construct an electrical equipment upon its own property.

The matter was again referred to the corporation counsel's office, which then advised that "I am of the opinion that you have the jurisdiction over the entire right-of-way as far as the same is within the limits of the city of New York." * * * On February 8, 1906, the railroad company wrote requesting "approval of the plans and method of construction of its lines and transmission of electric current along its right-of-way * * * and that permission be given to the placing in, under and over said streets of such transmission lines in the manner shown."

Meanwhile change had been made in the personnel of the commissionership of the city department, and the new commissioner issued a permit March 27, 1906, to the railroad company for certain construction, with the exception that "I do not authorize the construction of overhead 11,000-volts, high-tension transmission conductors within the city limits of New York or the erection of uninsulated conductors placed upon the poles carrying 660 volts for the feeder system proposed, but shall require them to be insulated according to the rules and regulations of this department." This permit, slightly modified at the request of the railroad, was finally issued on June 5, 1906.

The exception taken by the city to the erection of high-tension lines was based upon the opinion of the city's consulting electrical engineer, protests from the New York Board of Fire Underwriters and the Rapid Transit Commissioners. Furthermore, the stand taken by the city's representatives would appear consistent with the policy of the city, dating back to 1884, when it demanded in no uncertain tones that overhead wires carrying dangerous electric currents should be put underground. The Legislature had also passed laws which had since been incorporated in the city charter, prohibiting the erection of high-tension lines within the limits of the boroughs of Manhattan and Bronx; although allowing such erection in the outlying districts of the other boroughs upon temporary permits issued at the option of the commissioner.

Despite the apparently definite prohibition of the head of the city department, the New York Central Railroad proceeded to erect its high-tension aerial lines along its own right-of-way and across the streets and aqueducts intersecting its property, in order to carry out the plans it had already formulated in conjunction with the electrification of its lines within the limits of the city of New York as required by legislative enactments. The railroad company, waiting only a short time for the city to consider this matter, and without having received any reply to the request of August 24, 1905, for a permit, had proceeded with the construction of its line work, so that by January 1, 1906, some four to six miles of overhead lines were constructed or in the course of erection, and since that time it has completed a total 12.9 miles of aerial lines within the city limits.

A few months later another change was made in the head of the department of water supply, gas and electricity, and the new commissioner had his attention called to the construction installed by the New York Central. He thereupon called a conference with representatives of the railroad company and the city's engineers with a view to ascertaining what justification the railroad might have of its position and what, if any, engineering difficulties prohibited the carrying out of the orders of the preceding commissioner. At this hearing the attorney for the railroad, in reply to inquiry, stated that the construction of these overhead lines was permanent and the railroad had no intention of changing them. This definite stand by the company forced the city to action. The commissioner advised the railroad company in writing, after further consultation with the city's engineers, that unless they desired a further hearing, he would refer the question to the Public Service Commission of the First District; which, after two months' interval of time, was done.

From the above it will be seen that the attitude of the city is in conformity with the requirements of the city charter, and that three successive commissioners, each acting independently, carefully and deliberately considered the case, in turn being advised by three successive and different corporation counsels as to the legal situation and by the experts of the city with regard to engineering matters.

In addition to legislative requirements the city claims that within the limits of one of the largest cities of the world with a rapidly growing population, with the necessity for uninterrupted transportation, there should be used engineering precautions to protect life and property to a degree required but in few other places in the world. It holds that the stringing of bare high-tension wires across the tracks of the Interborough railway, which annually transports more passengers than all the rest of the railroads in the United States, that the maintenance of bare high-tension conductors on poles within 3½ to 4 feet and up to 11 feet of the rails, as shown by the testimony, and the crossing of important thoroughfares with high-tension wires, is not proper construction in view of all considerations of the case.

It has, therefore, asked the Public Service Commission to order the railroad to place underground all its high-tension aerial lines along its right-of-way and over city streets within the limits of Greater New York.

The railroad company attempted to prove to the commission: First, that its aerial lines were properly designed and erected and were as substantial, durable and safe, if not more safe, than any similar lines anywhere in existence; second, that high-tension aerial lines were in use extensively throughout the country and in other cities; third, that the cost of replacing with conduits and underground cables the 10.4 miles of aerial lines constructed would amount to $2,018,000, and was therefore prohibitive, and, fourth, that aerial construction was more reliable as regards continuity of service and as safe and safer to the traveling public, whether in trains or open city steets spanned by aerial lines.

In substantiation of the above points, the railroad company called as its witnesses its several engineers, and particularly Mr. George Gibbs, a member of the Electrical Commission appointed by the railroad, which had made the original plans providing for the construction of the aerial lines. Mr. Gibbs' testimony related more particularly to reliability and safety of the aerial lines as compared with underground conduits. He stated, "My practice now is not to put in a foot of conduit line where I do not have to," and explained that "while underground construction may be required in congested districts, aerial lines are less expensive, less difficult to maintain, and less liable to trouble." He also stated that he "preferred simple, durable construction for aerial lines in crossing streets or other aerial lines rather than the installation of cables, forms and special construction." When asked whether overhead or underground construction was the safer from the standpoint of the traveling public, Mr. Gibbs replied, "I suppose I will be misunderstood if I answer that question directly and say that the overhead is as safe as the underground, but that is the answer to it."

Mr. Harold W. Buck, consulting engineer, agreed with Mr. Gibbs that the aerial line was easier to maintain and less expensive to install. He considered that it would be necessary to build the conduits so that they would project considerably above the level of the ground, in order to avoid water getting into them along much of the right-of-way of the railroad adjacent to the Harlem and Hudson rivers. Such construction would be as objectionable in case of derailed trains as the present aerial construction.

With regard to the relative safety of aerial and underground construction of the type and along the right-of-way in question, Mr. Buck stated, "I should think that both involved different risks, but to about the same extent," confirming this by stating that in his judgment no additional safety could be secured by burying the aerial lines crossing the elevated tracks of the Interborough railroad.

In rebuttal the city called as its expert, Mr. Henry Floy, consulting engineer, who testified at length. He admitted on behalf of the city that the aerial lines of the New York Central Railroad were well designed and substantially built, and, except for some minor points in details of erection, the lines were good examples of aerial construction. He cited a number of installations to show that the underground system of distribution at voltages of 11,000 and higher were too common to cause special comment, and that voltages up to 30,000, even in ducts more or less filled with water, are successfully used. He stated that in his opinion it was no question but that the underground construction was safer than aerial construction as regards the traveling public, the overhead system being apt to be brought down by the derailments of trains, storms of wind, ice or lightning. He called attention to the fact that no grounded guard wire had been installed, nor any extraordinary precaution taken against lightning, which he considered might do extensive damage to apparatus and shut down the system for hours.

Mr. Floy called attention to the carrying of high-tension lines over telephone and telegraph wires and above viaducts and the Interborough railroad where it is on a viaduct without any protection, in contradistinction to the method of construction used by the railroad in carrying the high-tension wires over its own main tracks where in each case it has built a substantial steel bridge on which the wires were supported. He explained that in case a high-tension wire came in contact with a steel car filled with passengers the car would become charged, but probably without danger to the occupants, unless a passenger formed a bridge between the ground and the car, in which case the car being partly insulated, by resting on the ties or dry earth, instant death would probably result.

Mr. Floy further expressed the opinion that there were no extraordinary or insurmountable difficulties to be met in building conduits along the railroad right-of-way. He criticized the railroad's estimates of the cost of doing this work as too high, and corrected the estimate of $2,018,000 for 10.4 miles of construction necessary to replace the present aerial lines, placing the cost at $1,453,-660. He proposed to replace the aerial lines on the Harlem Division as far as Woodlawn, and on the Hudson Division as far as Spuyten Duyvil, where the railroad strikes the Hudson River, stating that this substitution of seven miles of underground construction for the larger proposition of 10.4 miles would secure all the advantages of the latter, as such construction would avoid crossing the viaducts or streets, and save the necessity of placing any poles near the tracks within the city limits. The estimate for this work amounted to $988,324, and was made on the same basis as the first estimate, except the number of ducts was reduced from 20 to 16, because only eight ducts would be required for placing the present aerial conduits underground, and he considered 100 per cent. ample margin for further extensions. Mr. Floy's figures were made up after several careful investigations of the right-of-way, using the railroad's maps for distance as the basis of estimate.

In answer to questions, Mr. Floy said that it was not desirable or practicable to require all electric light and traction companies to place their wires underground, as doing so would practically bankrupt them, but he clearly stated that for the conditions being considered, he believed underground construction practical, more safe, and not prohibitively expensive. In supporting his claims for reliability of underground distribution system, Mr. Floy quoted records made by the company at Buffalo, N. Y., where only two break-downs on the high-tension system were recorded, covering a period of six years, 1900-1906, and these were due to mechanical interference. He also gave figures showing that the New York Edison Company, during the past nine years of operation on its 200 miles of high-tension underground cables, had only 18 "unavoidable breakdowns of circuits in service," or an average of one per year per 100 miles of cable. Similarly, the Interborough Rapid Transit Company had only one breakdown on 46 miles of cable, and altogether it has 375 miles of the 11,000-volt cable in use.

A. S. Lyman, who appeared for the company, argued that the question was one of the utmost importance to the future of electric power. "It is contended," he said, "that our overhead transmission lines are a menace. Yet we have constructed them to withstand a four-and-one-half-inch coating of ice and a wind of 90 miles an hour, neither of which conditions ever prevails in this climate. If you are not content with this strength and order us to place our wires underground, we should have to do the same with our wires throughout our system. The time may come when we will want to extend electrical working as far north as Albany. The expense of putting wires underground would, however, make that absolutely prohibitive."

The Public Service Commission will soon render a decision on the subject.

Looking toward the consolidation of all the lines in St. Louis County into one holding corporation, the Missouri Electric Railway Company has been incorporated with a capital stock of $1,000,000. Robert McCulloch is the principal holder of the new stock.

SELLING ELECTRICITY

Under this heading will appear, from time to time, articles, suggestions and examples which will be of assistance in the constant effort to increase the existing demand for electric current and to create new demands.

CHEERFULNESS AND UNREMITTING "HUSTLE" WON OUT IN YOUNGSTOWN

The following account of an example of a central-station new-business department continued during the business depression was presented to the National Electric Light Association at Chicago by Mr. W. B. Woolfink of Youngstown, Ohio.

The former all-absorbing proposition of new-business getting sank momentarily into insignificance when the result of last October's panic made it apparent that for some time there might be no new business to get, and the Mahoning and Shenango Railway and Light Company was faced with the serious proposition of what to do with our erstwhile new-business getters, who apparently had no future fields to conquer. Reluctant to go backward and not knowing just what to do, we did nothing but "sit tight in the boat," endeavoring to hold on to what business we already had, and for several weeks were most actively engaged in this vitally important work.

It required no astuteness to find the danger point, as our offices in Youngstown, Ohio, and Sharon and New Castle, Pa., were crowded with merchants possessed with a hysterical desire to curtail expenses, whose cry was "Our light bills are too high; we must reduce expenses. Electric light is the one thing we can get along without." Here was an excellent opportunity for our salesmen to prove their true worth in stormy weather, as they had already done in fair.

Our sales department proved adaptable. After the first shock our entire force of 11 salesmen was converted into a "missionary department," whose business it was to wear a cheerful smile, a buttonhole bouquet, and visit from merchant to merchant, preaching "Renewed prosperity is just around the corner." No one was allowed to talk "hard times." Cheerfulness and hopefulness formed the order of the day, and it was not long before we found that the visits of our salesmen were looked forward to with pleasure by despondent merchants who needed boosting up. Convincing arguments were used to show the necessity of brightly lighted stores and windows to insure the sale of the Christmas stock already purchased. We increased our newspaper space and adopted new forms of advertising, with every advertisement breathing cheerfulness and prosperity. Our monthly bulletin took up the cry and all hands pulled with a vim to drive out the gloom.

A weak point in our system was soon discovered to be that we were selling all of our window and sign lighting on meter rates. Despite our best efforts, the sign and window lights were being turned off at closing time. We quickly worked up a flat-rate proposition of 50 cents per 16-candlepower lamp per month, the company to turn the lamps on at dusk and off at 11 o'clock. A circular letter was written to each merchant and sent out through the mails, setting forth the advantages of this flat rate, which encouraged long-hour burning. These letters were speedily followed up by solicitors' calls. By this time the effects of the first shock were wearing off and our flat-rate proposition met with great favor. During November and December last one salesman alone closed up contracts for flat-rate window lighting aggregating $3,600 per year on five-year-term contracts, thus retaining business that was almost lost. The missionary work of the sales department was telling heavily, as could soon easily be seen in the changed appearance of our streets at night. As soon as they were available, tungsten lamps were used to combat natural-gas arcs, with surprising effect.

Special attention was given to further developing our sign business on a flat rate per lamp a month, including switching charges. Our flat-rate window-lighting proposition had opened the way for the sign campaign, and during the last 30 days we have, in Youngstown alone, contracted for 15 additional signs aggregating 2,126 two-candlepower lamps at an average rate of 12 cents per lamp per month, with fully 18 more large signs on the prospect list. At the end of this present campaign we shall have installed not less than 70 very presentable signs on the main street in a town of not more than 75,000 people. As these signs burn on long-hour schedule, we do not consider this an unsatisfactory performance in times of depression.

Our chief salesman had worked up a proposition whereby the local merchants can install advertising signs on the buildings in our street-railway parks at this same rate of charge per lamp. This proposition is meeting with great success, as it accomplishes a double purpose of advertising for the merchant and attractively illuminating our parks.

At the start the wisdom of our policy in not disbanding our sales force seemed questionable, but the results in gross receipts during the months of November and December last indicates that all three of our companies did a larger business than in any previous months in their history. Our reconstructed sales department practically took on no new business during this period, but turned the tide from impending loss to certain profit by holding and increasing the business we already had.

As was naturally to be expected, the rate of increase in November and December has not been in the least maintained, the first three months of 1908 showing barely a five per cent. increase over the same months of the previous year. However, the question in our minds now is, "Where should we be had we cut off entirely our sales, or 'missionary' department?"

Our power department was not showing the desired results, so, in face of this depression in business, we added two additional men to this department and started energetically to pump dry the power field adjacent to our lines. Business was harder to get, so we went after it harder. For the first 60 days our power men accomplished absolutely no tangible results in dollars and cents, but we soon began to find that central-station service appealed to the power user most strongly in times of business depression. "Reduced operating expenses" then has a particularly pleasant sound to him, and our power agents are meeting with a generally cordial reception.

Manufacturers, large and small, now prove far less anxious to sink new money in additional private-plant equipment and are more easily persuaded to avail themselves of the investment which the central station has already made for their benefit; their surplus funds are needed in other channels. We have found them far more likely to consider abandoning their own comparatively inefficient plants when the reduction in operating expenses seems so much more necessary than when a large gross income kept the ratio of operating expenses down within reasonable limits. While our power department has made no phenomenal record, it is able, even during the slack period, not only to pay its expenses, but in a large measure to offset the loss in income due to the closing down of several of our customers' plants. Moreover, a large amount of missionary work has been done by this department, and it is plain to us that as soon as the industry of this section attains anything like normal conditions the business of this department will show most handsome returns in new-business gains. The head of this department is now closing, after four months' hard work, three contracts aggregating $15,000, and the engineering department has made tests on plants whose total loads will amount to at least 3,000 horsepower, and the indications are that within the next 90 days a considerable portion of this load will be taken over on our lines.

Our views are naturally colored by our success after adopting the policy of increased commercial aggression during hard times. We feel most strongly, however, that the central station should not entirely disband the commercial and advertising departments during periods when business is so hard to get and harder than ever to retain.

REDUCTION OF RATES IN CHICAGO

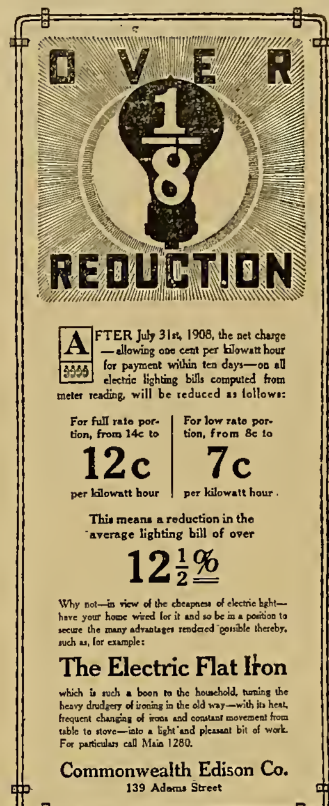
Following the provisions made in the ordinance passed by the Chicago City Council on March 23d of this year, the Commonwealth Edison Company has announced that a further reduction in rates will go into effect on the first of August. With the discount allowed for the payment of bills within 10 days after presentation, customers will obtain current for lighting at the following rates: Full-rate portion, 12 cents a kilowatt-hour; low-rate portion, seven cents a kilowatt-hour. At the present time the rates, deducting the discount of one cent per kilowatt-hour for payment within 10 days, are 14 cents and eight cents. The reduction effected by the terms of the ordinance under which the company makes this change, will in the case of the average lighting bill mean a saving of more than 12½ per cent.

The term "full rate" refers to the price for a supply not exceeding the equivalent of 30 hours' use per month of the consumer's maximum requirement. Amounts used in excess of this are included under the "low" rate.

The above rates may remain in force until August 1, 1912, with the exception of a further reduction of one cent per kilowatt in the low rate after August 1, 1909. The city of Chicago receives three per cent. of the gross receipts of the company.

CENTRAL-STATION ADVERTISING

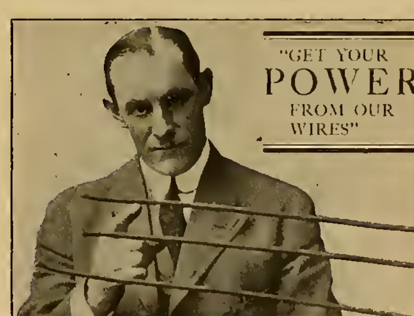
The accompanying reproduction shows the forceful advertising in the Chicago daily papers by which the Commonwealth Edison Company calls at-



CENTRAL-STATION NEWSPAPER ADVERTISING.

tention to its reduction in rates, and improves the opportunity to impress the advantages of electrical accessories in the household. Commonwealth Edison advertising copy is always well presented and accompanied by illustrations that arrest attention. The original of this "ad" was two columns wide and 11 inches high.

The accompanying illustration, "Get Your Power from Our Wires," is reproduced from the advertising literature of the Denver Gas and Electric Company. It arrests attention and is not apt to



CENTRAL-STATION MAIL ADVERTISING.

be overlooked. The man in the picture has an expression of downright earnestness, as though he thoroughly believed in his subject, as every salesman should.

During a sudden violent storm on the evening of July 17th a large tent sheltering 1,500 people attending a Chautauqua gathering at Chicago Heights, Ill., was blown down on the heads of the crowd. After the big canvas fell the electric lights continued to burn and those under the fallen tent were enabled by the light to find their way out, otherwise a panic probably would have resulted. As it was, only four persons were slightly hurt.

CONTRACTORS' ASSOCIATION

[*Continued from page 61.*]

composed a theater party to the Studebaker Theater, witnessing "The Top o' the World," a musical extravaganza.

Friday's programme called for an all-day outing to Michigan City, Ind., going and returning by the steamship Theodore Roosevelt. The steamer left Chicago shortly before 10 o'clock, arrived at Michigan City after noon, and the return trip was begun at 4:30 p. m. Lunch was served on board the vessel both trips. On the return trip the photograph reproduced on page 00 was taken.

At the Michigan City Amusement Park there was a 100-yard race for the ladies, a fat men's race, a potato race and a swimming race.

At two o'clock cars were taken for the baseball grounds, where two teams representing the East and the West, and captained, respectively, by George W. Russell and E. McCleary, played the great national game.

CONVENTION NOTES.

Manufacturing Agent Crockett certainly did his share.

Francis Raymond talked salesmanship, as usual, and mingled with his "pupils."

Chicago Manager Finney of the Chicago Mica Company was well to the front.

R. L. Thayer appeared on behalf of the St. Louis Malleable Casting Company of St. Louis, Mo.

Representative Crawford of W. N. Matthews & Bro., St. Louis, was active during the convention.

A. I. Appleton of the Appleton Electric Company was among those in attendance at the convention.

Vice-president H. C. Rice of the General Incandescent Lamp Company of Cleveland mingled with "the bunch."

H. A. Baum and S. Grossman of the Safety Electric Company were on hand booming business for their company.

Advertising Manager H. I. Markham of the Federal Electric Company, Chicago, was active every day at the convention.

Following are the names of the gentlemen appearing on behalf of the Central Electric Company, Chicago: H. W. Young, F. R. Bryant, A. S. Pearl.

E. Kuhlman of the Kuhlman Electric Company was on hand as usual, renewing acquaintances and setting forth the merits of the Kuhlman transformer.

A. O. Einstein, sales manager for the Crescent Company, was in daily attendance at the convention and was kept busy shaking hands with his friends.

President Charles Edward Brown of the American Electrical Supply Company, Chicago, made a hit as substitute umpire in the baseball game at Michigan City.

The Chicago Insulated Wire Company put in its usual appearance through Secretary and Treasurer Smith. This company has a large number of friends among electrical contractors.

Ubiquitous Arthur Merrill of the Chicago Fuse Wire Company strolled in and mingled with the "boys." Mr. Merrill reports the fuse wire business as picking up very materially.

F. A. Berlin, secretary of the American Electric Construction Company was a busy personage at the convention. He was conspicuous in the entertaining of the members and guests.

Gerry M. Sanborn, the newly-elected president of the National Electrical Contractors' Association, is a member of the Sanborn-Marsh Company, electrical contractors and engineers, of Indianapolis.

I. A. Bennett, the well-known manufacturers' agent, found time to be on hand every day. He managed to slip into the hands of a number of his warm friends an attractive fountain-pen souvenir.

General Manager Homer E. Niesz of the Chicago Electrical show was in constant attendance during the convention. At the Chicago Electric Club luncheon Mr. Niesz made a hit with his speech.

The next convention of the association will be held at Toledo, Ohio, July 19, 1909. The selection was in part the result of the efforts of a number of Toledo boomers who attended the Chicago meetings.

Secretary E. C. Hennis of the Sandwich Electric Company of Sandwich, Ill., was on hand Thursday. Mr. Hennis reports a remarkable business with the railroad companies in the exploiture of the Sandwich company's telephone system operating in conjunction and over existing railway telegraph lines. The company is reported to have made wonderful progress in duplexing and even triplexing railway telegraph lines.

Western Manager James Wolff of the New York Insulated Wire Company and the Paiste company, as usual, was most energetic in all convention and publicity matters. Mr. Wolff has many friends among the contractors.

Sales Manager John W. Brooks, in company with Western Manager G. B. W. Ingham of Pass & Seymour, were active at the Auditorium. Mr. Brooks made a special trip from Solvay to be on hand at the convention.

H. R. Hixson, western manager of the Simplex Electrical Company, exchanged greetings with friends and acquaintances at the convention. J. N. Macalister, of the Chicago office of the same company, was also on hand.

S. M. McFedries and W. R. Harvey of the J. L. Schureman Company were in daily attendance at the convention and were kept busy meeting their numerous friends and talking the company's automatic motor-controlling devices.

Of course, Western Manager James R. Wiley of the Standard Underground Cable Company was "on the job." Robert S. Hopkins from the New York office and J. E. O'Neil from the Chicago office were likewise in attendance.

Thos. G. Grier and his corps of active young assistants were most decidedly "in evidence" all during the convention. Mr. Grier has just returned from an eastern trip to his family estate in Maryland, not far from Washington.

Silas R. Fralick represented the Blake Signal and Manufacturing Company and the Barkelew Electric Manufacturing Company, with great success. Mr. Fralick is popular with the electrical fraternity and was busy shaking hands with his old friends and making new ones.

President W. W. Cheney, Jr., of the International Electric Meter Company, Chicago, assisted by his energetic representatives, Messrs. Jackson and Benson, was on hand daily, and nightly as well, during the contractors' convention, losing no chance at hospitable entertainment.

H. A. Kling had something to say about "arcless indicator fuses," which are made by his company, the Detroit Fuse Manufacturing Company, Detroit, Mich. The company has just issued a new complete catalogue on its line of fuses, and Mr. Kling was distributing it during the convention.

Vice-president C. E. Corrigan, accompanied by Mrs. Corrigan and mother, were among those most warmly welcomed by the National Metal Moulding Company's friends among the contractors. The Corrigan party, after entertaining lavishly, left on a short trip on the boat to Mackinac Island.

Alfred E. Braddell came on from Philadelphia on behalf of the conduit and supply department of the Sprague Electric Company. Mr. Braddell is an Englishman that came to the United States a number of years ago and has found this country so much to his liking that he has remained ever since.

Cecil Wood of the Moline Incandescent Lamp Company was on hand daily. Mr. Wood has just returned from a trip throughout both the East and the West, and reports the demand for Moline tungsten lamps as little short of phenomenal. In fact, the company is talking of a material extension in factory facilities.

One of the convention visitors who came a long distance was H. F. Frosch, manager of the San Francisco office of the Federal Electric Company. A former Chicagoan, Mr. Frosch met many old friends. He says that San Francisco is planning a great electrical show, and his experience with the Chicago Electrical Show enables him to be a judge.

President H. B. Crouse of the Crouse-Hinds Company of Syracuse, N. Y., accompanied by his indefatigable western manager, F. F. Skeel, was in attendance every day during the meeting. Mr. Crouse came on from the factory especially to be present at the Auditorium sessions. During the Electric Club luncheon Mr. Crouse was called upon for a speech, and he stated that records of his business now show not only a steady and healthy increase since the first of the year, but that indications are for a business this fall greater than that of last year.

President Arthur Frantzen of the Zenco Company was one of the most active men at the contractors' convention. Now not only a leader in the contracting business, but also one of the most prominent jobbers in the West, Mr. Frantzen is a busy man. Under Mr. Frantzen the Zenco Company has become prominent during the last year. This house has a decided advantage in the possession of its various contracting and supply branches throughout the United States, where not only contractors but other purchasers from jobbing houses meet with that desired and necessary sympathy due to quick shipments from goods "on the spot."

James R. Deane, the aggressive yet courteous representative of the Guarantee Electric Company, did the honors for Secretary E. K. Rockwell, who was on hand, but could not remain throughout the entire convention period. Messrs. Rockwell and Deane are two of the most active members of the Electric Club of Chicago. Mr. Deane prophesies a splendid fall business.

The Nernst Lamp Company entertained convention visitors in a room fitted up on the parlor floor. Samples of the company's latest product were on exhibition. In the new lamp the base, heater and glower elements may be removed and replaced very simply. The parts are made interchangeable but are so arranged that no mistake in connection can be made.

C. R. Kreider, business manager for Kohler Bros., Chicago, was perhaps the busiest and most sought-for man at the convention. Aside from the duties of seeing that everybody was well taken care of, he was kept busily engaged explaining the Kohler system for printing-press control. The company distributed a handsome and artistic watch fob to the members and guests during the convention. Mr. Kreider was chairman of the local committee of arrangements for the convention, and is entitled to praise for his excellent work. He was reelected second vice-president of the association—an honor well bestowed.

Advertising Manager Thomas T. Richards of the Wagner Electric Manufacturing Company made his first appearance on Thursday morning. The instrument business of the Wagner company, under Mr. Richards' pushing, has during the last year increased to a degree that will dougtless before long require Mr. Richards to extend his sales force. The Wagner company's factory in St. Louis, possessed as it is with remarkable facilities for building electrical instruments of precision, has been the lever through which Mr. Richards has made such a remarkable showing in enlarging the output of the company's instrument department.

General Sales Manager A P. Munning of the Cutler-Hammer Company of Milwaukee was present and was assisted by Chicago Manager Van Vleet and his "right hower," Mr. James. These gentlemen this time had a new story to tell. The "something new" was the quick-snap switch that is now being placed on the market and which is described elsewhere in this issue of the Western Electrician. It is no exaggeration to say that this device has created a sensation in the switch-using world. The Cutler-Hammer company will send to anyone, as long as the samples last, a sample mechanism that has been prepared by Advertising Manager Benjamin of the company to illustrate graphically, forcibly and quickly the principle underlying this remarkable type of switch. Mr. Munning was enthusiastic on behalf of not only the company's large rheostat business, but its new department. "The company has for a long time," said Mr. Munning, "felt that its splendidly organized selling department could as well handle a few other good specialties. This switch is one of our first to be sprung on the electrical public." Here Mr. Munning smiled. "Now keep your eye open for the next."

The Western Electric Company entertained its guests at Suite 222 on the second floor of the Auditorium. The company had the parlors for the headquarters and general convenience of the members and ladies attending the convention, and a separate room for a small display of its manufactures. Several fan motors of both the alternating and direct-current types were on exhibition, as well as a five-horsepower direct-current motor and a five-horsepower induction motor. All the rooms were lighted by the new Sunbeam tungsten lamps, which attracted attention by their clear illumination that so much resembles daylight. Several different types of the intercommunicating telephone sets were shown, with many electrical supplies, such as bells, buzzers, batteries, resin core solder, soldering salts and sticks, black enameled wire, etc. The company donated and installed a dozen fan motors in the convention hall on the sixth floor, which were greatly appreciated during the long sessions. Automobiles were furnished to take guests out to the company's Hawthorne Works, where they were shown through the plant. Among those who made their headquarters at the company's rooms were: E. S. Keefer, New York; S. R. Faris, Dallas, Texas; Mr. and Mrs. L. J. Baldwin, Chicago; Mr. and Mrs. I. H. Butterworth, Dubuque, Iowa; Mr. Perrin, Waterloo, Iowa; M. R. Lash, Des Moines, Iowa; F. H. Van Gorder, Lansing, Mich.; O. O. Tucker, Madison, Wis.; H. M. Post, Chicago; F. A. Henderson, Chicago; Mr. Kuehn, Canton, Ohio; H. W. Dye, Chicago; H. M. Kennedy, Chicago; Mrs. C. P. Warner, Rockford, Ill.; R. J. Hardacker, Chicago. Of course, "Dusenbery" of the Western Electric Company was also an active convention attendant.

COMPROMISE ON MINIMUM CHARGE AT FORT DODGE

A compromise has been reached in the contention between the City Council of Fort Dodge, Iowa, and the Fort Dodge Light and Power Company, with the result that the case in court which had been preferred against the company will be withdrawn. The company supplies Fort Dodge with both gas and electricity, and asserted the right to set as minimum charges $1 a month for electric current and 50 cents a month for gas, whenever the meter readings showed the actual consumption had been less than this amount by the terms of the contract. This arbitrary minimum charge was objected to by the citizens, who instituted ouster proceedings, while an effort to adjust matters was welcomed by the company.

A special committee made a thorough investigation and submitted a report to the Council expressed in the following resolution:

"After investigating the question presented, we feel satisfied that the Light and Power company has no legal right under the present ordinances to make any charge whatever in excess of the rate fixed in said ordinances, and that the minimum charge made by said corporation * * * is illegal; and the authorities cited in the communication from the Light and Power company do not change our views upon these questions.

"We believe that the Light and Power company is entitled to make a reasonable minimum charge where said company has connected the premises of the consumer with its electric or gas service, and has installed its meter for the purpose of measuring electric current or gas consumed, and we recommend that the existing ordinances be so amended as to grant the said company the right to make a minimum charge of 50 cents a month for electricity and 25 cents a month for gas. Such minimum charges to be subject to the following conditions:

"The minimum charges shall not be made except in such cases where the premises of the consumer are connected with gas or electric service. The consumer shall have the right, upon one day's notice, to the Light and Power Company, to have his premises disconnected and the minimum charge ended until the premises are again connected with the service, such connection to be made within one day after notice to company is given."

This compromise (which was adopted) met with the approval of Manager William B. Foshay of the company, who has made a long-sustained effort to bring about a conciliation.

COMBINATION LAMP AND TROLLEY POLES IN MILWAUKEE

In order to give the citizens an opportunity to decide which form of lighting they prefer the Milwaukee Electric Railway and Light Company has installed on the city streets examples of bracket lights supported from buildings, and cluster lights on trolley poles. The latter are of wrought iron. Twelve feet from the base four arms of oxidized copper extend from the pole, and from each depends a globe containing a 100-candlepower Nernst light. The cap of the pole is ornamental, and to it is attached the trolley span wire. The pole is set vertically instead of at a slight angle.

TELEPHONE FOR TRAIN ORDERS

Substitution of the telephone for the telegraph in the operation and dispatch of railroad trains is progressing rapidly. Aside from its inherent advantages, the use of the telephone is being greatly accelerated by the coming into effect of the nine-hour telegraphers' law. Four large railroads in the Central West have the telephone in operation on various lines, aggregating 1,400 miles at present. These railroads are the Chicago and Northwestern; Illinois Central; Chicago, Rock Island and Pacific; Chicago, Burlington and Quincy. Within the next two months these roads are preparing to extend the use of the telephone on over 1,600 miles of additional lines.

Officials of the Cincinnati, Dayton and Fort Wayne Railway Company, which several years ago projected an electric road from Cincinnati to Dayton, Ohio, and Fort Wayne, Ind., a distance of 194 miles, expect shortly to begin the construction of a standard-gauge line between the points mentioned. Current to operate the cars will be supplied by the third-rail method. F. George of Dayton is president of the company.

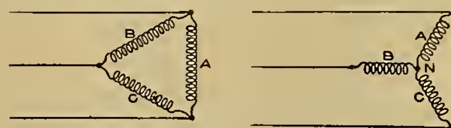
QUESTIONS AND ANSWERS

ALTERNATING-CURRENT CONNECTIONS

L. H., Chicago: What is the difference between star and delta connections? What is a synchronizing meter? What is an auxiliary circuit?

ANSWERS.

Three-phase alternating-current apparatus can be connected up in two ways, as shown by the accompanying diagram. By the method shown on the left the three coils or elements of the apparatus



Delta Connection Star Connection
ALTERNATING-CURRENT CONNECTIONS

are connected end to end in series with the lines connecting at the junction points; this is the delta or Δ method. By the method shown at the right the three coils or elements representing the three phases have each one end connected to a line and the other end to a common or neutral point N; this is the star or Y method. The neutral point is often connected to a neutral line wire; this is the four-wire, three-phase system.

A synchronizing meter or synchroscope is an instrument used, when connecting two alternating-current generators in parallel, to indicate the exact instant when they are running at the same cyclic speed or, as it is said, in synchronism. At that instant only should the machines be thrown in parallel.

An auxiliary circuit is any circuit that is a branch or adjunct of a main circuit, which it aids. Thus the shunt or cut-out circuit on an arc lamp for a series line, that is used to short-circuit the lamp terminals and therefore to maintain the line unbroken, in case there is a break or derangement of the main circuit through the lamp, may be regarded as an auxiliary circuit.

ADVANTAGES OF SINGLE-PHASE RAILWAYS

J. McK., San Antonio, Tex.: What are some of the advantages of single-phase railways over the regular direct-current system?

ANSWER.

Among the chief advantages possessed by the single-phase system are the comparative simplicity of the generation and transmission of power over great distances, at high voltage, its utilization directly without conversion and only simple transformation in high-voltage motors, simplicity of control of these motors and the resultant economies in first cost and in operation due to dispensing with rotary-converter sub-stations. Pressures up to 11,000 volts can be used directly on the trolley line, which can therefore be of comparatively small cross-section. The sub-stations, if any are used, contain only step-down transformers and require little attention. Furthermore, the motors used on single-phase systems are also serviceable on direct-current systems, so that a car can operate over a single-phase interurban or trunk line and also over a direct-current urban or terminal line.

MATERIAL FOR SELENIUM CELLS

W. T. P., Dowagiac, Mich.: Kindly tell me how the selenium cell which changes its resistance from the effect of rays of light is made. Is it made from selenium crystals or selenium precipitate?

ANSWER.

Either form of selenium may be used, since in any case the material is melted to give it the shape and connection to terminals desired. The crystalline form does not possess the light-sensitive property that the amorphous form does. Chemical supply houses usually handle the latter or stick form.

Some valuable suggestions in making selenium cells are contained in two articles in the Western Electrician of October 19, 1907, p. 308, and November 23, 1907, p. 407.

BREAK IN AN INSULATED WIRE

E. A. C., Keswick, Iowa: A peculiar case of trouble has come to my attention. A section of telephone wire was found to be apparently dead. It was replaced by a new piece of wire and the trouble thereby removed. The old wire seemed to be intact except that no current would pass through. What caused this?

ANSWER.

Though the insulation on the wire was intact, there was evidently a break in the wire itself. This may have been caused by excessive bending or by faulty manufacture. Some cases have been noted where new insulated wire has been found to be wanting in the metallic conductor for several feet, although outside appearances would not disclose the fact.

BOOK TABLE

QUESTIONS AND ANSWERS ABOUT ELECTRICAL APPARATUS. By W. B. Clayton and Jas. W. Craig. Lynn, Mass.: Clayton and Craig. 1908. Pp. (6 by 9 inches), 65, with 25 illustrations. Price, in paper, 35 cents; in cloth, 50 cents.

This book was written by two college graduates who had entered the testing department of the General Electric Company and while there compiled a series of notes on the electrical machinery that came up for test. From these notes the book was prepared. The apparatus considered comprises direct-current motors, induction motors, constant-potential and constant-current transformers, mercury-arc rectifiers, arc lamps and meters. About 120 queries in regard to the fundamental or characteristic principles and actions of these machines are clearly and concisely answered. While many of the questions refer to the particular types of these machines manufactured by the General Electric Company, a large number are of a general nature and apply to practically all types. The book therefore has considerable value. An enlargement of its scope and an increase in the number of queries answered in regard to each kind of machine along the lines so well followed with the rather limited number of questions considered in the present volume would make it a much more valuable book.

AMERICAN STREET RAILWAY INVESTMENTS. New York: McGraw Publishing Co. 1908. Pp. (9½ by 12¾ inches), 473, with 48 maps. Price, $5.

The fifteenth annual volume of what has come to be known as the "Red Book" contains, like its predecessors, a great mass of valuable information for investors and others interested in electric-railway securities. Reports are given of over 1,500 companies operating or controlling urban and interurban railways. These reports give as far as possible information as to charters and franchises; leased roads; capital stock and dividends; funded debt, with dates of issue and maturity, interest paid, trustees of mortgage; operating receipts and expenses, fixed charges, taxes, surplus and balance sheet (in many cases compared for several years); the plant and equipment, names of towns, parks and amusement resorts reached, and names of officers and directors. Maps of many of the principal systems are given. A number of pages contain similar information concerning companies in Canada, Cuba and the West Indies, Hawaii and the Philippine Islands. The names of national and state railroad commissioners are furnished. Separate tables are also given showing a comparison of gross receipts for the years 1906 and 1907 for about 570 companies.

TELEPHONE MEN AT SOUTH BEND

A convention of Independent telephone men of the First District of the Indiana State Association, about 40 in number, was held at South Bend on July 9th. The action taken by the American Express Company to dispense with the use of the Independent telephones in its offices as a matter of alleged economy was denounced as a clear case of discrimination in favor of the Bell service. A telegram was read from the vice-president and general manager of the American Express Company to the effect that the company would continue to use the Independent telephones in its offices, provided they were furnished free of cost. This communication aroused the indignation of the Independent telephone men, who declared that there was no reason for the discrimination in favor of the Bell Telephone Company's service; that such action was against public policy and the public convenience, for the reason that the Independent patrons number three to one of the Bell throughout the state.

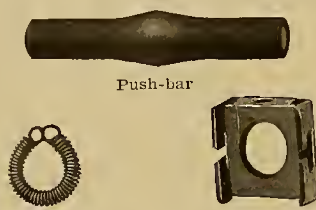
Following a business meeting, a dinner was served at the Oliver Hotel, which was greatly enjoyed by the members present. Samuel Thompson of Plymouth presided over the deliberations of the meeting.

The accounts of the Marconi Marine International Communication Company of London show a loss to date of £98,831.

SIMPLIFICATION OF PUSH-SWITCH CONSTRUCTION

A line of switches utilizing a new and ingenious contact-operating mechanism has been brought out by the Cutler-Hammer Manufacturing Company of Milwaukee.

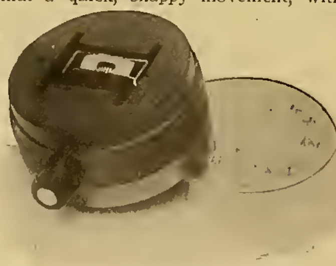
The line of these specialties produced thus far includes porcelain pendant switches, molding and



DETAILS OF NEW PUSH-SWITCH CONSTRUCTION

surface switches and push-button sockets, but interest in the innovation lies in the simple and ingenious mechanism which operates the contacts. This consists of only three moving parts: (1) a push-bar, extending clear through the switch; (2) a coiled steel spring, and (3) a moving contact piece. These parts are clearly illustrated herewith. They are assembled in the switch socket, of which a model of the mechanism is also illustrated.

The principle employed in the new Cutler-Hammer switch is that of a coiled spring wrapped around a double-opposed-cone surface. The action is similar to that of the movement of a rubber band placed over the hand when the tips of all thumb and fingers are pressed together tightly; when passed over the knuckles the band will of itself travel down the fingers. The cone surface on which the spring rolls is of lava and very free from friction. As the movement of the spring and of the contact piece which it propels, depends only on its passage of the middle ridge and not upon the speed with which the bar is moved, it will be seen that a quick, snappy movement, with a correspondingly rapid make or break, is effected, however slowly the bar is pushed.

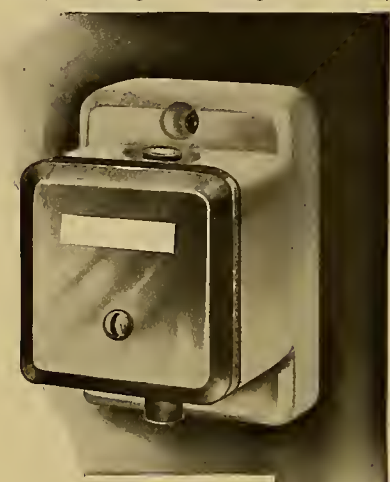


MODEL ILLUSTRATING PUSH-SWITCH MECHANISM

Of course the push-button mechanism may be adapted to many uses where a quick make-and-break is desired. Accompanying pictures show the adaptation of the same switch principle to pendent, surface and socket switches.

The new Cutler-Hammer push-button specialties are made of porcelain, which prevents tarnishing of parts, unpleasant shocks, etc. In the pendent devices liberal space is allowed for knotting the flexible cord. The removal of a single screw gives access to the interior of the switch. The porcelain makes an attractive finish, and, to harmonize with the surroundings, may be obtained in plain white, ivory tint, wood brown and neutral gray.

The manufacturer reports that these devices have been submitted to the Underwriters for approval and that word has been received from the laboratories at Chicago the approval has been given and that the cards will be issued soon.



ACTUAL SIZE

Porcelain Surface Switch (for concealed work)
6 amperes, 125 volts
2 amperes, 250 volts

ACTUAL SIZE

Brass Cap
Porcelain
Pendent Switch
6 amperes, 125 volts
2 amperes, 250 volts

ACTUAL SIZE

Porcelain Pendent Push Button Lamp Socket
50 candlepower, 250 volts.

PUSH-BUTTON SWITCHES MADE ON A NEW PRINCIPLE

A NEW AUTOMOBILE INSTRUMENT

The General Electric Company has lately placed on the market a new automobile instrument for use on electric vehicles. This instrument, known as the type DK, consists of a combination ammeter and voltmeter enclosed in a dust and moisture-proof aluminum case and is especially designed to withstand without injury the constant vibration and exposure incident to this class of service.

Both elements are constructed on the D'Arsonval principle. In the ammeter element a coil of wire carrying the current to be measured, or a shunted portion of it, is wound on a light aluminum frame, so pivoted in jeweled bearings as to move freely in a small annular space between a soft-iron core and the pole pieces of a permanent magnet. This

A NEW AUTOMOBILE INSTRUMENT

element is identical with that of the type D switchboard instrument, with the exception of the permanent magnet, which is made somewhat larger, in order that the voltmeter may be placed within the space enclosed by it.

The voltmeter has smaller parts throughout and differs slightly in construction. It has a circular form of armature frame instead of rectangular, and the core is a spherical piece of soft iron. Its general action is the same as that of the ammeter.

The instruments are dead-beat. The standard voltmeter scales are 120 and 80 volts. Either of two ammeter scales is standard, viz., 150-0-150 or 70-0-150, the scales showing both charging and discharging current. The severe vibrations to which automobile instruments may be subjected may prevent the indications being read. To overcome this difficulty, the General Electric Company has designed an "anti-vibration support" upon which the type DK instrument may be mounted.

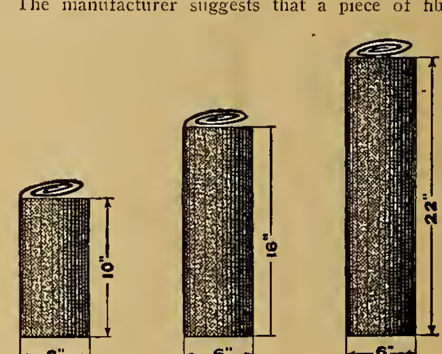
GROUND PLATES

The Federal cartridge ground plate is of interest to all practical men who have wrestled with the problem of making satisfactory ground connections in either telephone, street-railway or electric-lighting work. By its use a good ground can be secured at a minimum of expense and trouble.

The device is made in standard sizes, with a specified area of plate and size of ground wire. The copper surface is completely covered with the proper grade of charcoal for securing the best ground. The whole is incased in a netting which holds the charcoal securely in place while handling but breaks down when installed, allowing the earth to mix with the finely divided charcoal. The netting is intended to disintegrate rapidly as soon as the cartridge has been buried in moist earth. The heavy copper ground wire is firmly secured to the copper plate through its entire length, so that there is no chance for a break or loose connection.

Each complete plate is put up in a cylindrical cardboard case, which is for transportation only, and is, of course, removed when the plate is put in the ground. The hole can be made easily with a standard post-hole digger, so that the labor of installing is light.

The manufacturer suggests that a piece of fiber conduit be used to protect the wire from the ground plate to a point well above the surface of the ground. A rope drain fitted on the post or wall will lead considerable rain-water into this fiber conduit, and so direct to the ground plate, insuring moist earth around the plate. The Federal Electric Company of Chicago is the maker of this device.



GROUND PLATES IN THREE SIZES.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, July 8.—That the telephone service at Paris is to be reformed at a not very distant date may be surmised from the fact that a bill is to be laid before the Chamber of Deputies providing a large credit for improving the service. This amount is somewhere near $8,000,000. As to the programme of the reforms to be carried out, it includes the construction of no less than five new telephone exchanges in the city, and, besides this, the present exchanges are to have their capacity increased and other much-needed changes carried out. The exchanges in other cities of France will also be improved. It is estimated that about $6,000,000 will be needed for the improvements alone. A number of new interurban telephone lines are also required to meet the needs of the public, and for this purpose the Postal and Telegraph Department wishes to secure the sum of $2,000,000.

An extensive project is now on foot for an electric railway, and a number of hydraulic plants in Austria. The new line is known as the Laytal railroad, and it will be a standard-gauge road, some 40 miles long, extending from the town of Znaim to Raabs, so as to connect two of the leading railroads of the country—the Northwest and the Francis Joseph line. The new electric road is of interest from the fact that single-phase, 8,000-volt current is to be employed. Motor cars and electric locomotives on this system are planned, and they will carry transformers in order to reduce the voltage for the motors. There will be five feeding points for the line, and the current will come from a hydraulic plant which is to be built upon the Thaya River. This stream has several falls which can be utilized for future plants. At Vöttau, the first station giving about 2,000 horsepower will be erected for the use of the railroad, as well as for other purposes, and it will use a 500-foot dam with a 60-foot head of water. The plant will contain a number of three-phase and single-phase turbo-alternator groups, besides a crude-oil motor set, which is used as a standby. The pole lines will be operated at 20,000 volts at first, and this may be increased to 35,000 in the future. It is next proposed to build a hydraulic plant on the same river at Frain, having about the same amount of power.

In Italy, the State Railroad Department, whose headquarters are at Rome, is advertising for bids for electric material and other appliances, tools, etc., for the Valtellina system of electric railroads. The Council of Ministers has also authorized the State Railroads to treat with home or foreign construction companies in order to secure the necessary material for the application of electric traction on the Giovi railroad lines.

The annual congress of the French Association for the Advancement of Science is to be held at Clermont-Ferrand, in the region of Lyons, from the 3d to the 10th of August. In the physical section most of the electrical questions bear upon electromedical affairs and X-ray work, while the navigation section will bring out some interesting points relating to the use of the Rhone for hydroelectric power supply, in which the question of the Rhone-Paris power transmission is to be considered. The use of electric pumps in irrigation will also be treated, as well as that of electric locomotives for standard-gauge railroads.

A steam-turbine electric plant of large size has been erected in France, and it will serve for light and power for the extensive industrial district which includes the cities of Lille, Roubaix and Tourcoing. This manufacturing district is one of the largest on the Continent, but formerly it was not well supplied with current, as only a few small plants were erected. A large electric station was accordingly erected at the locality of Wasquehal, not far from Roubaix, and before long its capacity will be increased to 35,000 horsepower, making it rank with the large steam plants of the Continent. There will soon be seven steam-turbine and three-phase alternator units running. A. DE C.

GREAT BRITAIN

London, July 11.—A company has this week been floated, and a prospectus offered to the public, for placing on the streets of London 500 electric taxicabs. The venture is backed by Sir David Salomons, one of the pioneers of electric traction of this character in Great Britain, and the Electromobile Company, which has the credit of being the only successful company operating electric vehicles, apart from omnibuses, in London. It is calculated that the gross earnings of each cab upon the existing tariff for taxicabs would be £2 a day, from which seven shillings would have to be deducted for the driver. Operation and maintenance will absorb 19s. 6d., leaving a profit per cab per day of 13s. 6d. Upon 500 cabs, therefore, the gross profit would be £105,630, from which is deducted rent of taximeters, licenses, insurance and reserve amounting in the aggregate to £40,865, leaving a net profit of £64,765. It is estimated that the first 100 cabs would be running on the streets within eight months. The promotion of this company recalls to memory a similar venture which came to grief in London some years ago, but the general conditions then and now are very different. But the new electric cabs will have a formidable competitor in the fine service of petrol taxicabs, which are remarkably silent and generally inoffensive.

Sir Clifton Robinson has been having something to say of the tramways of the world before a conference of the Tramways and Light Railways Association. Three points which handicap British tramway companies in comparison with other countries are, in his opinion, first, that our cars are not permitted to travel fast enough, the average speed being less than 10 miles per hour; second, the double-deck car in use here causes much delay, particularly at stopping points. The adoption of this type of car was consequent upon the regulation that no car would be licensed to carry any passenger for whom a seat was not provided. The third handicap was the licensing restrictions, which ought to be removed on special occasions.

The very strong complaints recently made by the cable companies of damage to their cables by steam trawlers has led to the appointment of a committee to consider the question, particularly in view of the recent interruptions of transatlantic cables off the southwest coast of Ireland.

An interesting but not vital alteration was made in the clauses of the new bulk supply company's bill promoted by Messrs. Parshall and Hammond in the concluding proceedings last week. In all these bills in the past it has been the custom to allow a power user to use 20 per cent. of his demand for lighting purposes, for the obvious reason that no power user wishes to have separate mains and meters for his power and lighting. Arguments were put forward by the opposition, however, that with the higher efficiency metal-filament lamps this percentage was an unfair one to the lighting authorities already in existence, as it would enable a consumer to put in quite a small power installation, say only a motor and a fan, in order to get his lighting current at a cheaper rate, and so bring about competition for lighting pure and simple, which was not claimed to be the object of the power company. The committee took this view and reduced the percentage to 15 per cent., although five per cent. was the amount asked by the opponents.

The buildings for the Manchester electrical exhibition are now taking shape. There will be one large hall, measuring 500 by 185 feet. Already three-fourths of the floor space has been allotted, and practically all the remainder is under option.

The South Wales Electrical Power Distribution Company has been saved from a very awkward position by the passing of its bill. Under this, all the company's power houses have been transferred either to municipalities or to separate companies, while arrangements with their creditors to receive £150 in debentures for every £100 credit have also been legalized. G.

EASTERN CANADA

Ottawa, July 18.—It is announced that Mr. John D. Oppe, general manager for Canada of the Marconi Wireless Company, has sent in his resignation to headquarters in London, England.

The Grand Trunk and Canadian Pacific railroads are trying the car-axle system of electric lighting on their trains. It is not yet decided whether the system shall be adopted.

The Hydro-electric Commission of Ontario received 27 tenders for the construction of the transmission line from Niagara Falls, to distribute power to the western municipalities of the province. The line will cost 10 per cent. less than the estimate. Fully 50 per cent. will also be saved on the cost of right-of-way, so that the eventual cost of delivering power will be much less than the original estimate on which the agreements with the municipalities were based.

The Ontario Power Company has offered to supply the city of Niagara Falls, Ont., with 1,000 horsepower or more delivered at the electric-light station, at $14 per horsepower per annum. The City Council has also received an offer from the Canadian Niagara Power Company to supply the city with 500 horsepower or more at $15 per horsepower. These offers are being considered.

Mr. Leslie M. Shaw, former secretary of the United States Treasury, together with several American capitalists, have been for some little time in Montreal. It is said that they are negotiating on the old scheme to control the Montreal Power Company and eventually the Montreal street railway. This season, for the first time, the power company will be in a position to make use of the power from the Soulanges Canal, which will so greatly increase the possibilities of supply as to allow great extension of the company's system. A. V. W.

NEW ENGLAND

Boston, July 18.—A bill in equity has been brought in the Supreme Court of Massachusetts by Kidder, Peabody & Co., bankers, to have the New York, New Haven and Hartford Railroad Company execute and deliver to the trustees of the New England Investment and Security Company its guaranty of a new certificate of stock in the latter company, and that the trustees in turn be ordered to obtain the guaranty and to issue in the name of the Worcester Art Museum, and deliver to the complainants a new certificate for shares of the preferred stock of the Investment and Security Company guaranteed.

It appears that the complainants, Kidder, Peabody & Co., indorsed a certificate of stock to the art museum and called upon the companies concerned to guaantee it, but were refused. It is believed that the case will be made a test case and appealed to the United States Supreme Court if necessary for the purpose of determining the status of the securities of the New Haven road in this state, in view of the complications that have arisen regarding the railroad company's right to hold trolley-company securities and acquire street-railway properties.

A similar case is pending in Connecticut, brought by Mackay & Co., relating to the guaranty alleged to have been assumed by the New Haven road in taking over the Consolidated Railway Company, wherein the order prayed for was issued and the company appealed to the United States Supreme Court.

The Waltham Gas and Electric Light Company, owned by the Boston Suburban Electric Companies, has reduced the price of electricity from 17 cents to 16 cents per kilowatt-hour.

Mayor W. C. Park and the city treasurer of Woonsocket, R. I., have signed a contract for five years with the Woonsocket Electric Machine and Power Company for electric lights for the city, arc lights to cost $120 per light per year and incandescent lights 30 cents per light per night. B.

NEW YORK

New York City, July 18.—The electric zone of the New Haven Railroad was disabled by a lightning disturbance Tuesday afternoon, and every train on the road from Woodlawn to Stamford, Conn., was stopped for two hours. No difficulty was experienced from Woodlawn into New York, but all the way to Stamford the blockade was complete, and it became necessary to call in the aid of the discarded steam locomotives to move the trains. Later it was found that the main power house of the line at Cos Cob, Conn., had received the bulk of the lightning shock, putting some of the generators out of business. The electric system was in shape at nightfall.

Dr. Lee De Forest says that he will build a tower for the wireless telephone on the roof of the Terminal Building at Park Avenue and Forty-first Street. The steel structure will rise 85 feet above the top of the Terminal Building, with poles extending above the tower itself for an additional 40 feet; the tips of the poles will thus be 300 feet above the pavement.

From financial circles comes the report that Thomas F. Ryan is in control of the Interborough Rapid Transit Company, and that August Belmont has been forced into the background. It is stated that Edward P. Bryan, president of the Interborough, who is now in Europe, will remain abroad six months, and when he returns the position of president of that company will have been abolished. H. H. Vreeland, president of the Metropolitan Securities Company, is expected to resign shortly and Mr. Ryan may name his successor. According to report, Thomas F. Ryan is overlord of all the elevated, surface and subway lines in Manhattan and the Bronx, with the exception of the Third Avenue and Union systems and a few crosstown horse-car lines.

In two years electric trains will begin running between Bridgeport, Conn., and New York city, providing hour trains and possibly 50-minute expresses. From Stamford to New York the electrification work has been completed, so that all trains are now being hauled between those points by electric locomotives. The work is now at a standstill, presumably on account of the business situation. When operations are resumed it will take about two years to get trains running from Stamford to Bridgeport. Already over $1,000,000 has been expended on the first division of the electrification system which will shortly reduce the time from New York to Bridgeport by 10 or 15 minutes. One-hour-and-a-quarter express trains from Bridgeport to New York is said to be a change of the near future, for from Stamford to New York a speed of a mile a minute or 70 miles an hour can easily be made with the electric trains.

Three hundred telephone clerks of the New York Stock Exchange are to be examined for tuberculosis germs by a representative of the board of health. These clerks use the same telephones as the members of the exchange, and the examination will be made as carefully as possible in order to reduce the chance of infection to a minimum.

A severe rain on Tuesday, July 14, caused neighboring sewers to become choked and overflow, resulting in flooding the McAdoo Tunnel at Sixth Avenue and Ninth Street. In a few minutes water had risen above the third rail and a train which came through at this point was stopped. Forty passengers got out and walked back three or four squares to Christopher Street station, taking the matter as a joke. The lights in the train did not go out, as each car carries storage batteries for auxiliary lighting. No trains were run in the flooded tunnel until the following morning.

Judge Lacombe of the United States Circuit Court has granted the motion of Bronson Winthrop, counsel for the Morton Trust Company, and has appointed W. W. Ladd as separate receiver for the New York City Railway, thus relieving Adrian H. Joline and Douglass Robertson, who are serving in addition as receivers for the Metropolitan Street Railway Company. W.

OHIO

Toledo, July 18.—For the purpose of cutting out the curves at Bellevue the Lake Shore Electric Railway Company has bought considerable right-of-way in and near Huron, on the east end of the line. With this improvement, the Lake Shore will be an almost air-line road.

A marked improvement in the service of the Sandusky, Norwalk and Mansfield electric railway has been made. Heretofore the passengers making the trip by way of Sandusky were compelled to change cars at Norwalk. This feature is eliminated, and the running time cut down to two hours, from Shelby to Sandusky.

The telephone companies in the eastern part of the state have been much annoyed by wire thieves during the last two weeks.

The New Bremen electric-light plant was partially destroyed by fire recently. Only the brick walls remain standing, with the roof intact. The greater portion of the machinery was rendered useless by the heat. The origin of the fire is unknown, but it is believed to have been caused by the overheating of the cylinders in one of the gas engines. The plant has been operated by the village but a short time. The town is without lights until new machinery can be purchased and installed. The estimated loss is about $5,000.

For the purpose of establishing the stops and fare limits on the Mansfield-Ashland interurban line, which will be placed in operation immediately, a party consisting of C. A. Wilcoxson, general manager of the Cleveland and Southwestern lines; J. O. Wilson, general passenger agent; S. A. Foltz, general superintendent; Superintendent Gray of the Galion line, and Roy Antibus, engineer, went over the line. A 30-cent fare was decided upon. The road was found to be in fairly good condition, with only a little ballasting to be done at the end of the line.

The first car over the new Lima-Bellefontaine electric railway arrived at Lima on schedule time, carrying 20 passengers. It took only two hours to make the trip to Lima. A power plant will be erected at Bulkhead soon, but for the present the power station at Medway, between Springfield and Dayton, supplies the demand. From Waynesfield south as far as Lakeview, there is not a single curve in the line, and in fact all along the line there are fewer curves than in the same length of track on any other road in Ohio. When the road is in top condition the trip from Lima to Bellefontaine, all down grade, and over a track with practically no curves, will be a fast one.

H. L. S.

INDIANA

Indianapolis, July 18.—It is officially announced that the Kokomo, Frankfort and Terre Haute Traction Company will let contracts for the construction of 105 miles of traction line between Kokomo and Terre Haute via Frankfort and Crawfordsville in a short time. Applications have been made for franchises to enter Frankfort and Terre Haute. When these are granted the entire right-of-way and the necessary franchises to enter cities along the line will have been secured.

Work on the construction of the Evansville Terminal Railway's line, between Evansville and Newburgh, was begun on July 13th.

The unexpected heavy traffic on the new Chicago, Lake Shore and South Bend Railway has made it necessary for the management to rearrange its schedule and add additional rolling stock. Travel between South Bend and Michigan City has been so heavy the line has been unable to accommodate it.

Charles L. Henry, receiver of the Indianapolis and Cincinnati Traction Company, has been granted permission by the court to issue renewal certificates for $900,000 worth of receiver's certificates secured by first lien upon the company's property. Mr. Henry was appointed receiver of the company under a friendly action by stockholders, and the receiver's certificates are calculated to raise funds for extending the line from Shelbyville to Greensburg and from Rushville to Connersville.

Although the annual report of the Bluffton municipal electric-light plant shows a gross earning of $24,000, nothing remains to the credit of the reserve fund. The earnings for the year have been eaten up by the expense of $7,000 for coal, $5,000 for labor and the remainder for extensions and improvements. The management says that next year a surplus can be shown.

The Converse Consolidated Telephone Company of Converse, capitalized at $20,000, has filed articles of incorporation with the Secretary of State. T. P. Sylvan, J. W. Stickney and others are directors.

The semi-annual report of the Indianapolis Telephone Company, made to the city controller, as required by franchise, for the half year ending July 1st, shows that on that date the company had in service a total of 8,510 telephones. The company pays the city $6,000 a year, plus $2 for each telephone in excess of 6,000 in use. Thus the settlement was made for $5,510, covering the first half of 1908.

Perry J. Freeman has been elected president of the Richmond Home Telephone Company, to succeed A. C. Lindemuth, who resigned a few days ago, because of the fact that a working agreement between the Central Union and the Home company was brought about without his concurrence. S. S.

MICHIGAN

Detroit, July 18.—A franchise for an electric-light plant has been granted Glenn Gardner by the village of Pinckney, but construction of the plant will not be begun until the contracts have been closed, to insure the venture being a paying one.

The Council of Sutton's Bay has granted a 30-year franchise to the Pellston Electric Light and Power Company, and a contract to light the streets will probably be granted.

The Michigan State Telephone Company will build a toll line between Traverse City and Manistee. The line will be about 70 miles in length.

The Wequetonsing Association of Harbor Springs is considering the erecting of an electric-light and water plant.

The Council at Manton has employed a civil engineer to make a report on the feasibility of operating a municipal electric plant by waterpower from Cedar Creek. If the dam is built, it will restore Lake Billings, one of the most beautiful in that section.

The Toledo and Ottawa Beach Railway Company has been granted a franchise by the Monroe Council. The line is now in operation from Toledo to Toledo Beach, within four miles of Monroe. The line will probably be extended to Detroit. The franchise provides that no freight business can be done in the streets; that the company must pave the entire width of the street, build a depot and sprinkle any street occupied by it to the satisfaction of the Council. The line is owned by the Toledo Railways and Light Company.

The Council of Owosso has been notified by the Owosso-Corunna Electric Light Company that if it refuses to grant a franchise to the Shiawassee Light and Power Company it will begin the construction of the Owosso-Durand interurban line within 90 days.

Since purchasing the electric-light company at Mount Clemens the St. Clair Edison Company has made very extensive improvements. The entire distributing system has been reconstructed, and the power-house equipment has been modernized and connected with transmission line to Detroit. A tunnel under the Clinton River is now under construction. This will enable additional feeders to be installed, so that the regulation of the entire system can be very greatly improved. A trench is being dug across the river into which a 42-inch steel tube will be sunk and covered with concrete. It will then be pumped out, and 36 conduits will be placed in it. B. J. D.

ILLINOIS

Peoria, July 18.—The Illinois Traction Company placed its new limited service in operation between Springfield and Bloomington this week and also between Peoria and Bloomington and between Peoria and Springfield. Four limited cars will be operated from Bloomington each day without change and three others with changes at Mackinaw will be run. The running time from Bloomington to Springfield is three hours, which is one hour shorter than the schedule via Decatur. With this is also a car each hour between this city and Bloomington, which calls for the addition of four cars. The run to Springfield is made via Mackinaw, over the new Lincoln-Mackinaw line that has just been completed. The company has issued elaborate time tables, with running time at each station, and cuts showing the interior of the cars. It has also issued postal cards showing the cars and calling the line the connecting link between the city and the country.

Though the Illinois Traction Company has temporarily abandoned the building of the Springfield-Jacksonville line, it is now thought that the line will be built by a new company, organized for that purpose at Jacksonville. The probability is that if this company does build the line it will later be taken over by the traction company.

The Illinois Traction Company will build the spur line from Weldon Springs to Clinton. This line has been in contemplation for some time, and now will be built in time for the "Chautauqua" which will be held this fall.

The Illinois Traction Company has ordered 10 new passenger trailers to be placed on the Springfield, St. Louis and Peoria lines in the fall. Six of them are sleeping cars, two are parlor cars and the others are regular day coaches. A sleeper will be attached on the night runs to a regular day-coach motor car, and a parlor car will be attached to a day-coach motor car, while a day-coach trailer will be attached to a day-coach motor car, making two-car trains, which will enable the company to give the best of service.

The executive board of the International Brotherhood of Electrical Workers held its annual meeting in Springfield this week at the office of Peter W. Collins, the grand secretary. V. N.

NORTHWESTERN STATES

Minneapolis, July 18.—A special election at Sioux City, Iowa, is called for August 4th to vote on the franchise for the traction company. If the vote carries the company will probably construct the Coles addition extension this year.

An election will be held at Eldora, Iowa, on July 31st to vote on two propositions with reference to the Iowa interurban road. One is for a five per cent. tax, to be paid the company at the stated time of collection if by that time it has reached Hubbard or Radcliff. The other relates to a franchise for the company.

The Village Council of Deer River, Minn., will grant a liberal franchise for an electric-lighting plant.

An ordinance has been passed at Grand Forks, N. D., granting a franchise to five local men to construct and operate a street-railway system.

J. A. Murray of Wilkesbarre, Pa., offers to take over the light and water plant at Aitkin, Minn., for 25 years and furnish free street lighting and water for fire protection and free light and water for the school house as rental.

The Wausau Street Railway Company of Wausau, Wis., has started work on a new power house and plant which will double its present capacity.

The Common Council of Pipestone, Minn., has made a contract with the Pipestone Electric Light, Heat and Power Company for five years for the maintenance and operation of 25 street arc lamps on an all-night moonlight schedule for $96 each per year.

The Polar Star electric-light plant at Faribault, Minn., was sold at sheriff's sale to Samuel E. Giles of Minneapolis for $31,000, including the contract for lighting the city for 18 years.

The Northwestern Telephone Exchange Company has made a reduction of rates for service at St. Cloud, Minn. The new rates are on the basis of $3 a month for business connections, single line, and $2 for a single connection residence service.

The Montana Star Telephone Company of Culbertson, Mont., has been incorporated for $20,000, with I. L. Brooks as president.

The Dubuque & Delaware County Telephone Company of Dyersville, Iowa, has been incorporated for $100,000. Geo. E. McFarland is president.

The Interstate Telephone Company of Dyersville, Iowa, denies that it is in any way connected with the recent merger of the companies which passed over into the control of the Bell system. R.

WESTERN CANADA

Winnipeg, July 18.—A canvass has been made of the farmers in the township of Cypress River, Man., for the purpose of ascertaining if it would be possible to secure enough subscribers to warrant the installation of a rural telephone system. A number of subscribers were signed on the roll, and arrangements are now being made for the installation of a system. J. A. Morcombe, Cypress River, Man., may be addressed.

W. Howard, Miniota, Man., will receive sealed tenders until noon, July 30th, for the construction of a municipal telephone system throughout the municipality of Miniota. Plans and specifications may be seen at the municipal offices at Miniota and also at the offices of the Manitoba Telephone Commission, Winnipeg, Man.

The City Council of Lethbridge, Alberta, has decided to adopt the report of the special committee and purchase the electric company's plant.

The contract for supplying materials to the Lumsden Radial Telephone Company, Lumsden, Sask., has been awarded to the Northern Electric Company, Winnipeg and Montreal, Que.

Mayor Williams of Fort Francis, Ont., has wired the Town Council from Toronto that in return for certain concessions he has secured free power for the town for 10 years. He also wired that work on the $3,000,000 dam will be commenced as soon as the American capitalists have secured the necessary funds.

S. P. Porter, deputy minister of railways and telephones, Regina, Sask., will receive bids until July 30th, at noon, for the supply of insulators, top-pieces, cross-arms, guy wire and pole-line hardware required for the construction of the government telephone system.

Lewis Simes, a farmer residing to the north of Canora, Sask., says the rural telephone system in his neighborhood will soon become a reality. Forty farmers have signed agreements to two miles of poles each, making a pole line 80 miles long. At a meeting held a few days ago estimates showed that a subscription of $35 apiece from the 40 subscribers would be sufficient to build the line. An expert telephone man will be secured to install the instruments. R.

PACIFIC SLOPE

San Francisco, July 15.—A number of petitions, bearing the names of more than 1,000 commercial organizations, banks, hotels, business houses and individuals, calling on the San Francisco Board of Supervisors to permit the operation of cars by electricity on the outer tracks on lower Market Street, without the imposition of conditions recently named, have been filed with the clerk of that body.

Mayor Mott of Oakland, Cal., has signed an ordinance granting a franchise for an electric railway on certain portions of East Sixteenth Street to the Oakland Traction Company.

The ordinance granting permission to the Southern Pacific Company to electrify its local railroad lines in Alameda, Cal., will be introduced at the City Council meeting of July 20th, when all of the details will be explained. The railroad officials say they are anxious to push the work ahead just as soon as the franchise is granted. The change will include an interurban service between Alameda and Oakland, as well as an electric service between Alameda and San Francisco.

The Needles Light and Power Company has been incorporated with a capital stock of $50,000 by W. P. Palmer, W. W. Perry and M. P. Thye, to furnish electric power for lighting and other purposes at Needles, Cal.

The Glenn County Telephone Company's loop from Orland, Cal., to the East Park dam site near Stony Ford has been completed and turned over to the government. The company built this line for the use of the government while it is building the large reservoir of the Orland irrigation project. The company has applied for a franchise in the town of Willows.

A deal has been completed by which the Home Telephone Company of San Diego, Cal., is taken over by a syndicate of eastern capitalists. The names given are H. A. Harris and A. E. Wlison of Chicago, F. F. Graves of Ohio and C. P. Platt, the Pacific Coast representative of the Harris people. Mr. Harris, it is understood, represents the makers of the automatic telephone apparatus used by the local company. The price is said to be $120,000 and the assumption of all debts of the company.

A contract has been let by the Portland Railway, Light and Power Company to William S. Barstow & Co. of New York for installing an underground system of conduits and cables in Portland, Ore., at cost of over $1,000,000. The contractors have offices in Portland, in charge of William S. Turner. Complete plans are being prepared and work will commence in a short time.

The Midway Telephone and Telegraph Company will rebuild its telephone line between Klamath Falls, Ore., and Midway with a copper metallic circuit in order to prevent interference from the high-voltage transmission line installed by Moore Bros. between Bonanza and Klamath Falls.

Commissioner McGregor has awarded a contract to the West Coast Supply Company for furnishing 57 transformers for the municipal electric-lighting system of Tacoma, Wash., on its bid of $8,045. A lower bid was received, but the guarantee of this company was so much stronger than that of the lower bidder that it was thought best to accept its proposal. Bids for a city power plant will not be called for until September, although the date was to have been July 8th, the change being made in order to give contractors more time to prepare plans and estimates. Specifications call for a plant with headworks sufficient to develop 20,000 horsepower.

San Francisco district agency of the Allis-Chalmers Company has closed a contract to supply a complete new hydro-electric plant for the Holton Power Company at El Centro, Cal. A 1,150-horsepower turbine operating under a head of 66 feet at 450 revolutions per minute is to be direct-connected to a 350-kilowatt and a 250-kilowatt alternating-current generator.

It is understood that additional machinery is to be purchased by the Pacific Gas and Electric Company, now that the sale of $4,000,000 worth of bonds is assured. Among other items, a 5,000-kilowatt steam turbine generating set is included, which is to be installed in Oakland or San Francisco. A.

PERSONAL

Mr. George Ross Green of Philadelphia has been appointed chairman of the committee on meters of the National Electric Light Association.

Mr. Robert S. Stewart of Detroit has been reappointed as chairman of the committee on lightning protection of the National Electric Light Association.

Mr. Albert J. Marshall, well known as a lecturer on illuminating engineering, has resigned from the Holophane Company to become chief engineer of the Bureau of Illuminating Engineering of New York city.

Lieutenant F. G. Loring of the Royal Navy has been appointed inspector of wireless telegraphy at the British General Postoffice, following the coming into force of the radio-telegraphic convention on July 1st.

Nicholas J. Kelly, formerly chief engineer of the Buffalo General Electric Company, died at his home in Buffalo, N. Y., on July 8th. Mr. Kelly was thrown from his buggy about two months ago by the breaking of a wheel and had never recovered from that accident.

Mr. Edwin Williams, sales manager of the insulated wire and cable department of the Diamond Rubber Company, Akron, Ohio, was a Chicago visitor last week. Mr. Williams is just returning from an extensive trip and reports the wire business as improving.

Mr. Robert Kuhn, secretary of the American Electrical Heater Company, Detroit, Mich., visited Chicago last week. Mr. Kuhn was a guest of President W. W. Low, of the Electric Appliance Company, for dinner and the dance at the South Shore Country Club.

President Hirschberg of the Excello Arc Lamp Company of New York arrived in New York on July 16th from an extended trip in Europe. Mr. Hirschberg was accompanied abroad by Mrs. Hirschberg and visited while on the Continent the birthplace of the Excello arc lamp.

J. S. Belden, father of Mr. Joseph C. Belden, president of the Belden Manufacturing Company of Chicago, maker of insulated wire, died on July 19th, at his home on Prairie Avenue, Chicago. The deceased gentleman, who was prominent in the insurance business, was also a stockholder in the company of which his son was president.

Mr. W. A. Converse, assistant secretary and chemical director of the Dearborn Drug and Chemical Works, Chicago, was elected to the position of secretary and chemical director at a meeting of the board of directors, held at the general offices of the company on July 8th. Mr. Ralph R. Browning, assistant treasurer, was elected to the office of treasurer of the company at the same time. Both Mr. Converse and Mr. Browning have been connected with the Dearborn company for several years.

Mr. W. L. Abbott, chief operating engineer of the Commonwealth Edison Company, was elected chairman of a joint committee to aid in combating the smoke nuisance in Chicago at a meeting held on July 15th of those interested in the problem. On this committee Mr. Abbott will represent the Western Society of Engineers. The secretary is Mr. A. Bement, consulting engineer. The other members are Messrs. Paul Bird, of the city smoke inspection bureau, and Carl Scholz, of the Illinois Coal Operators' Association.

Alexander Graham Bell will be honored by the people of Brantford, Ontario, who have just finished raising the sum of $40,000 for a memorial to him, as the inventor of the telephone. It was just outside of the city that Professor Bell made his first successful experiments with the telephone. With the money subscribed several blocks of land in the center of the city have been purchased and will be turned into public parks. In addition a monument will be erected to perpetuate the name of the inventor, and all this has been done by a little city with a population of barely 20,000 souls.

Mr. W. H. Butler has many friends among telephone people and especially among last year's Chicago electrical show exhibitors, who will be interested to know that he has been appointed Chicago district manager for the General Compressed Air and Vacuum Machinery Company of St. Louis. President J. S. Thurman of this company has felt the need of an aggressive northern department, with headquarters at Chicago; and Mr. Butler was selected as the man with the requirements for that responsible position. Mr. Butler is a Yale graduate of the class of '90. Mr. Butler not only earned the degree of bachelor of science at Yale, but not a few of his friends will be a little surprised to learn that he holds the cup (winning it after a keen contest of three years) as the fastest single-scull oarsman at his college up to the year of his graduation. Concluding his scientific course at the university, Mr. Butler worked for two years at the Schenectady works of the old Edison Electric Company. For a short time he was assigned to assist at Edison's private laboratory in Orange, N. J. While connected with the Edison people Mr. Butler was the author of a descriptive brochure treating of all the Edison industries in existence at that time. This volume was handsomely illustrated, and 1,000 copies were distributed among the prominent officers of the Edison interests. Severing his connection with the Edison company, he did newspaper work in South America and, then returning, he became interested as assistant manager with the Akron Electrical Manufacturing Company, Akron, Ohio. In 1895, however, he started in the telephone business and was literally one of the pioneers in the Independent telephone movement. Mr. Butler, as general manager, first built the Kent and Ravenna (Ohio) exchanges and lines. The company, under Mr. Butler's management, grew into the much larger organization which now operates three or four exchanges under the more comprehensive title of the Portage County Telephone Company. The lines of the Portage company form a network over the entire northern part of Ohio and give the only Independent service for that district. It was three years ago that the Portage County Telephone Company was organized, and Mr. Butler was its general manager until the time he sold out his stock in the telephone business to become heavily interested in, and act as general manager for, the Lincoln Sand and Gravel Company of Lincoln, Ill. Legal difficulties with the majority interests of the last-named company caused him to sever his connection with that institution. During last winter Mr. Butler accepted the position of assistant to General Manager Niesz of the Chicago Electrical Trades Exposition Company. During the space-selling campaign of the Chicago electrical show Mr. Butler was energetic and aggressive, yet courteous. He not only sold a large amount of space but made for himself many friends that will serve him well in his operations in the Chicago district on behalf of the General Compressed Air and Vacuum Machinery Company. Mr. Butler will make a specialty, among other things, of promoting the relations of his company with the electric-light and power companies in the West—a policy inaugurated by President Thurman.

W. H. BUTLER.

ELECTRIC LIGHTING

The Lathrop (Mo.) Light, Heat and Power Company has been incorporated with a capital stock of $5,500.

The Sidney (Iowa) Light, Heat and Power Company has been incorporated with a capital stock of $15,000.

The culminating event of the celebration by the Shriners holding a conclave in St. Paul recently was the electrical parade through streets festooned with 25,000 electric lights.

President W. C. L. Eglin is determined to get a thousand new members for the National Electric Light Association this year. He has brought in 50 new Class B members from his own company in Philadelphia.

Commonwealth Edison stock, which sold at 85 at the time of the formation of the company last September by the consolidation of the Chicago Edison

Company and the Commonwealth Electric Company, is now quoted at 104 and 105.

The Midland Electric Company of Des Moines, Iowa, has been incorporated with a capital of $25,000 by H. S. J. Towner and others.

In the manufacture of glassware for arc lamps exacting conditions are imposed not only with regard to illumination, but to the effects of heat, pressure and chemical action. Experience has shown that the blackening of inner globes is due principally to two causes: First, the decomposition of ordinary glass, due to heat and chemical action; second, the inner surface of the globe, softened by heat, catches particles of unconsumed carbon projected from the arc, which become firmly embedded in the glass. Glass intended to withstand hard usage ordinarily contains a large percentage of lead, which, however, makes the glass soften when heated. The secret of successful manufacture of glass for inner globes consists in the substitution of other ingredients for the lead, in order to secure great mechanical strength, and at the same time a high fusing point. For the convenience of purchasers, the General Electric Company has issued Bulletin No. 4596, describing heat-resisting inner globes and giving dimensions of all standard sizes.

ELECTRIC RAILWAYS

Actual construction work has been commenced on the new interurban line from Evansville to Newburg, Ind.

From Houston to Harrisburg, Tex., work has been commenced on the route of the new interurban. Steel rails are now being scattered along the right-of-way.

Cambridge City, Ind., has brought suit against the Terre Haute, Indianapolis and Eastern Traction Company, charging that return current from the Company's tracks has done considerable damage to underground pipes by electrolysis.

The Ouachita Valley Construction Company proposes to build a railroad from Hot Springs to Mena, in Polk County, Ark. Frank S. Treadway heads the company, which was recently incorporated with a capital stock of $100,000.

Reports of a big electric-railway merger have it that the property of the Winnebago Traction Company and the property of the Eastern Wisconsin Railway and Light Company will be taken over by a syndicate of which John I. Beggs of Milwaukee is at the head.

Announcement has been made in Pittsburg that plans are being prepared by the Pittsburg and Lake Erie Railroad Company to electrify its lines in the Beaver Valley from Pittsburg to Beaver Falls. The electric trains will use the regular passenger tracks. It is expected that the new system will be in operation by this time next year.

United States Consul-general Henry B. Miller of Yokohama, Japan, reports that it is announced that the department of communications has granted a charter to the Muhashi Electric Railway Company to build a line from Tengen-ji-Bridge, in the Iliro-o suburb of Tokio, direct to Hiranuma, with branch lines to Chofu-mura and Kamada. It is announced that the line will be built in accordance with the private-railway law, and that consequently it will be planned on a much larger scale than that followed in the case of ordinary electric railways.

On July 17th the Chicago City Council passed the ordinance granting the Northwestern Elevated Railroad the right to build a stub-end terminal over North Water Street from the main line at Wells Street to Clark Street. This two-block spur, as reported in these columns last October, will give the road an opportunity to run many trains during the rush hours without going around the Union Loop. At the present time 35 Northwestern trains an hour are sent around the Loop in the busy hours. It is expected that 15 trains an hour will use the new terminal, thus increasing the train service at least 33 per cent. The new terminal will cost about $100,000 and will run above the tracks of the Chicago and Northwestern steam railroad. As a condition to the grant the Northwestern Elevated had to agree to through-route its trains and to give and receive transfers from all other elevated roads whenever the city requires all these roads to do so.

POWER TRANSMISSION

The Valley Power Company of Wenatchee, Wash., has a large part of the material for its new line on the ground, but is still waiting for its franchise from the city, which, the company contends, makes too strict requirements.

United States Consul Alfred A. Winslow, of Valparaiso, Chile, reports that the Compania Cervecera de Valdivia, at Valdivia, Chile, is about to put in an extensive electrical plant to be driven by waterpower. It is estimated to cost $547,500 gold, and will supply power for the company's works, for lighting the city and for other plants. It is the intention to complete the work by the end of the year.

Canadian newspapers report that an American syndicate, with $40,000,000 capital, headed by Leslie M. Shaw, formerly secretary of the United States treasury, is negotiating for control of the Montreal Power Company, with the intention of subsequently gaining control of a number of other Canadian public-service corporations. The syndicate is known as the Canadian Public Service Corporation.

TELEPHONE

W. J. Johnson and others are organizing a telephone company at Belle Fourche, S. D.

The Fayette Home Telephone Company of Lexington, Ky., contemplates making $60,000 of improvements.

W. S. Smith of Tompkinsville, Ky., heads the incorporators of a new telephone company capitalized at $6,000 for that city.

The Going Telephone Company of Harrisburg, Ark., has been chartered for $50,000, for the purpose of establishing a local and long-distance telephone exchange. L. C. Going heads the incorporators.

The associated Bell telephone operating companies, not including the long-distance lines of the American Telephone and Telegraph Company, report for May: Telephone revenue, $9,890,300; general operating and maintenance expenses, $7,266,900; net. $2,623,400. Included in expenses are $2,801,600 for maintenance and $416,300 for taxes.

Pew telephones have been installed in the First Methodist Episcopal Church of Evanston, near Chicago, Ill., at the suggestion of the pastor. Four pews have been fitted up with receivers attached to wires running from a sounding box standing on a table in front of the pulpit as the pastor speaks. The instruments are used in the pews of old people who have slightly defective hearing.

On July 16th the American Electric Telephone Company of Chicago protested to the Board of Review of Cook County against being overlooked in the matter of assessment and expressed its desire to be taxed. "Do you mean that you really are desirous of being taxed when the assessors overlooked you?" asked one of the members of the board. "Permit me to congratulate your company. We don't often have the pleasure of running across such an instance as this."

President B. G. Hubbell of the Consolidated Telephone Company, which is the holding company for all the local exchanges in Western New York, has been interviewed in relation to the report of a merger of all the Independent telephone companies west of the Mississippi River in one $100,000,000 corporation. "The report is premature," said President Hubbell. "So far as I know, no definite steps have been taken. All the Independents now between New York and Kansas are connected in a way, but not in unison. Something definite will be done very shortly, I expect. Some very large financial interests are looking into the proposition."

The Mexican army is to be equipped with a field telephone system. The order for the necessary apparatus has been placed with a concern in Germany. In addition to the field-telephone system, the government will connect all of its military posts with railroad and telegraph points by means of telephone lines. Recent experiments have shown that a continuous battery discharge by heavy artillery ordnance does not interfere with communications by telephone. Special telephone corps will be organized in the army to operate the field telephone systems. It is stated that these corps will be separate from the Signal Corps, which now forms an important branch of the government military service.

PUBLICATIONS

"It is easy to see through," says the F. Bissell Company of Toledo, referring not only to a piece of glass on its August calendar card, but also to the constant increase in its patronage. The calendar is sent on request.

The Monthly Bulletin of the Ohio Brass Company, Mansfield, Ohio, for July, 1908, has an article comparing electric haulage with compressed air, and also concludes the paper by Mr. F. S. Denneen, assistant chief engineer of the company, on "Insulation of High-tension Transmission Lines."

Osborne's extension brick drill is of especial interest to electrical wiremen. It is described in a booklet published by the manufacturer, H. G. Osborne, at 74 Cortlandt Street, New York city. The drill consists of two parts—a hardened steel drill head and a piece of gas pipe threaded on one end to screw into the drill head for a handle. A list is given of the various sizes of drills suitable for drilling walls for porcelain tubes, loom, conduit and armored cable.

The Central Electric Company, Chicago, is distributing a new handbook giving considerable data on lighting with tungsten lamps. Tables are given, showing the cost of lighting with these lamps as compared to gas mantles and gas arcs, this being worked out at various values from 2 to 13 cents per kilowatt-hour.

Wickes Brothers, machinery manufacturers and dealers, Saginaw, Mich., are sending out their latest monthly stock list, dated July 15th. The list is a complete catalogue of their large stock of boilers, engines, condensers, pumps, generators, motors, fans, blowers, heating apparatus, cranes, tanks, pulleys, flywheels and miscellaneous machinery.

The Hoyt Electrical Instrument Works, Penacook, N. H., has a bulletin on "Ignition," which is free for the asking, and which explains the Hoyt voltammeter method of ignition testing. Simple indications by the instruments may be referred at once to the cause of the trouble so that batteries may be made dependable and given a long, useful life.

Ajax Bulletin No. 5, dated July, 1908, gives a complete list of the outdoor lighting specialties of the Ajax Line Material Company, 12 and 14 South Jefferson Street, Chicago. Among useful fittings listed are safety pulleys, swivel pulleys, polelocks, insulated turnbuckles and bolts, rainproof cord, insulator arms, spreaders, tree insulators, clamps, brackets, poletop fittings and hoods.

The Allis-Chalmers Company, Milwaukee, Wis., will send to anyone interested a copy of Bulletin No. 1042A, which describes in detail a vertical engine, direct-connected to an Allis-Chalmers "NI" generator. This unit has been found useful in supplying the demand for small isolated power and lighting plants. The points of advantage of engine and generator are set forth in the bulletin.

The monthly N. E. L. A. Bulletin, publication of which is due to Mr. Dudley Farrand, past-president of the National Electric Light Association, is one year old. Under the able editorial supervision of Miss Harriet Billings, assistant secretary and treasurer of the association, the Bulletin has become of much value to the members of the association. Mr. Alex J. Campbell is the editor of the Question Box—a conspicuous feature.

The Bristol Company of Waterbury, Conn., is distributing a new catalogue describing its new staggered-point steel belt lacing. This little book, which shows the result of 18 years' experience in the manufacture and use of steel belt lacing, lists a complete line of sizes of the latest design, thus adapting it to every kind and size of belt, ranging from the lightest belts to the heaviest conveyor belts. Practical experience, the manufacturers say, has proved that the 10 sizes shown in the book cover all the needs, as all kinds of belts of the same thickness may be laced with the same size of this staggered-point fastener. Bristol's belt lacing is made in a patented design by a patented process from cold rolled steel. Samples will be sent to persons interested on application.

The General Electric Company has just issued a circular, No. 3664, descriptive of its new locking socket. This socket prevents the removal of an incandescent lamp by an unauthorized person by permitting the socket shell to turn freely with the lamp on attempted unscrewing unless a key is inserted. Another bulletin, No. 4597, describes the Thomson astatic instruments for continuous-current switchboards. These instruments are extensively used, and have a reputation for reliability and accuracy regardless of external influence. The damping effect is produced by an aluminum disk moving in a magnet field, and the indications are dead beat. Type F, form K-7, oil switch, designed to meet the requirements of induction-motor installations, is described in bulletin No. 4575. The contacts are submerged in oil, and the oil switch is recommended as most suitable for use in cotton, flour, powder, or saw mills, or for electric installations in connection with oil-pumping and refining plants.

SOCIETIES AND SCHOOLS

The Arkansas state electrical dealers met at the Hotel Marion, at Little Rock, July 17th and 18th.

Prof. J. J. Thomson, Cavendish professor of experimental physics in the University of Cambridge, has been nominated for president of the meeting of the British Association for the Advancement of Science to be held in Winnipeg in 1909. The foundations for the new views of the electronic constitution of matter were laid by the work of Professor Thomson and his corps of assistants in the Cavendish laboratory. It is expected that the Canadian government will make an appropriation of $25,000 toward the expenses of the association's visit to

Winnipeg, which will probably occur the last of August, 1909.

MISCELLANEOUS

It is said that rubber of good quality may be raised in Sicily.

Trolley current charged the Twelfth Street bridge across the South Branch of the Chicago River, a few days ago, surprising persons and knocking down horses, until after a search the grounded wire was discovered. The trouble had been intermittent for several hours and was the result of the wooden trolley guard becoming charred.

Operating an aerial camera over 1,200 feet high with kites of the Eddy type, C. K. Hollister of New York city has equipped his apparatus, which weighs one and one-half pounds, with a battery and electromagnet. By sending up pasteboard "messengers" on the string their impact is used to close an electrical contact operating the camera shutter.

A joint committee of the American Railway Association, consisting of over a score of prominent railroad officials, was given an opportunity to witness a number of tests of automatic stopping of t train when passing danger points and a demonstration of train dispatching by telephone on July 17th on the Chicago, Burlington and Quincy Railroad, near Aurora, Ill. The tests were found entirely satisfactory. A train going at 50 miles an hour was brought to standstill 1,100 feet beyond a danger signal it had attempted to pass. This automatic device is electrically operated in connection with the block signaling system.

TRADE NEWS

W. W. Northcott, city purchasing agent, Victoria, B. C., will receive tenders until 4 p. m., August 3d, for the supply of 40,000 7-16-inch by 12-inch copper-coated carbons, and also for 10,000 7-16-inch by 8-inch copper-coated carbons, in accordance with specifications to be obtained at his office.

The Automatic Electric Company of Chicago has just closed a contract with the Citizens' Telephone Company of Grand Rapids, Mich., for a complete new automatic telephone exchange for the city of Lansing, Mich. This exchange is to have an initial capacity of about 1,700 main lines and will embody several new ideas in automatic equipment. It will be completed, it is expected, by December 15, 1908.

The Eveleth Electrical Company of Eveleth, Minn., having gone out of the electrical construction business, two employes, Frank Garske and Abram Raumma, will operate as the Zenith Electric Company, with headquarters on Jones Street.

Bids are solicited for the office furniture and mechanical outfit of the bankrupt International Telephone Manufacturing Company, occupying the third, fourth and fifth floors of a building at Harrison and Clinton streets, Chicago. The property consists of office furniture, stock, machinery and complete set of dies for the manufacture of telephone instruments, switchboards, etc., also all letters patent covering improvements in telephone appliances. Bids, accompanied by certified check for 25 per cent., will be received by Edwin Buell, receiver, 169 Jackson Boulevard, Chicago, until Monday, July 27th, 9:30 a. m.

BUSINESS

The State Board of Charities and Corrections of South Dakota has just awarded to the Minneapolis Steel and Machinery Company a contract for a 16 by 36-inch heavy-duty Twin City Corliss engine to be direct-connected to a 160-kilowatt alternating-current generator. This unit will be installed in the State Penitentiary at Sioux Falls, S. D.

The American Lumberman says that present conditions are ideal for the builder. The lessened cost of material plus the greater efficiency of labor and the economy in the time required to put up a structure operate greatly to reduce the outlay. "Final analysis shows that the interests of the various elements of trade are indissolubly linked together. To start building is to start at the beginning and upon a firm foundation to begin renewed activity. Build now."

The Massachusetts Chemical Company of Walpole, Mass., has just placed upon the market two new brands of friction tape which are spoken of as quite remarkable in their characteristics. The numbers of these friction tapes are 310 and 311, respectively, the former being cut straight and the latter cut on the bias. These tapes run 230 feet to the pound and gauge 0.011 in thickness. They are made of a special twisted cloth and are exceedingly strong. The compound with which they are impregnated and coated is neutral and will not deteriorate the fabrics. These tapes are primarily manufactured for armature-coil taping, and for this purpose are said to be more efficient and more conveniently handled than the ordinary webbings, the straight tape being used on the portion of the coil which goes in the slots and leads, while the bias tape is used on the curls of the coil. No danger need be feared from the work slipping while in process of taping, and the annoying feature of dropping a roll of webbing on the floor and having it roll out is impossible, of course, with friction tape. Moreover it has a high dielectric strength in itself and is also manufactured to combine with insulating compounds and make a workmanlike job. The thinness of this material will appeal to those who are tapping coils to be inserted in the narrow slots in armatures, and the bias tape will turn corners so readily that the work will lie absolutely flat.

DATES AHEAD.

Michigan Electric Association (annual meeting), Grand Rapids, Mich., August 18th to 21st.

International Association of Municipal Electricians (annual convention), Detroit, Mich., August 19th, 20th, 21st.

Ohio Electric Light Association (annual convention), Hotel Victory, Put-in-Bay Island, August 25th, 26th and 27th.

Old Time Telegraphers' Association and Society of the United States Military Telegraph Corps (annual reunion), Cataract-International Hotel, September 16th to 18th.

Colorado Electric Light, Power and Railway Association (annual convention), Glenwood Springs, Colo., September 16th, 17th and 18th.

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

Chicago Electrical Show (fourth annual), Coliseum, January 11 to 23, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) July 14, 1908

892,983. Manufacture of Hypochlorite Solutions by Electrolytic Methods. William P. Digby, London, England. Application filed September 18, 1906.

The process consists in shielding a number of anodes and cathodes from the main body of electrolyte by porous partitions disposed in proximity to the electrodes and forming porous cells therefor, and circulating a separate aqueous liquid through the cathode cells and anode cells and their connecting conduits.

892,996. Means for Controlling the flow of Gas. George G. Kothe, Lorain, Ohio. Application filed January 15, 1908.

A valve in a duct is arranged to be held open by a given pressure of gas thereon, and there are means for locking the valve in its closing position, means for holding the locking means in an inoperative position, electrical means controlled by the valve for rendering the holding means inoperative, and means controlled by the valve-locking means for opening the electric circuit.

893,015. Electric Heating Apparatus. William H. Ripley, Bloomfield, N. J., assignor to the Prometheus Electric Company. Application filed October 5, 1906.

A plate-warming oven is provided with an auxiliary housing within the chamber, passages between the chamber and housing, and heating means mounted in the housing and comprising a number of electrical resistance bars mounted on insulated lugs.

893,029. Bung Extractor. Gustav Spannagel, Lima, Ohio. Application filed July 3, 1906.

There are in combination a staff, means for attaching an electric lamp thereto, an inclosing caging for protecting the lamp, a spike beyond the caging, the lamp being between the staff and the spike and lying within the line of their axes.

893,034. Oscillating Fan. Ralph P. Thompson, Springfield, Ohio. Application filed December 5, 1907.

A stop-operated shifting mechanism for an electric fan is adapted to move the deflector into alternate operative positions, first on one side and then the opposite, of a vertical plane common to the axial line of the blade shaft.

893,067. Trolley-pole Attachment. Karl O. Garner, West Alexandria, Ohio. Application filed April 27, 1908.

The trolley pole has a supporting member with a tubular extension adapted to receive the end of the pole, the extension having slots therein adapted to receive pins on the trolley pole.

895,082. Illuminated Door-knob. John W. Lind, Boston, Mass., assignor to H. G. Williams and J. A. Spiker, Salt Lake City, Utah. Application filed May 1, 1907.

An escutcheon plate has at its rear side a recess. A hollow translucent door-knob is mounted in the escutcheon and contains an incandescent lamp. Circuit-closing contacts are mounted in the recess and operated by the door knob.

893,115. Automatic Vibrator for Telegraph Keys. Frank T. Vail, Minneapolis, Minn., assignor to the International Vailograph Company, Minneapolis, Minn. Application filed April 29, 1907.

In combination with a telegraph key is a vertically arranged vibratory spring, a contact carried thereby, a key-actuated operating member for the spring, and a second contact with which the spring-carried contact engages.

893,125. Selective Signaling System. Garrison Babcock, Chicago, Ill., assignor to the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Application filed July 17, 1903.

A selective ringing system for party lines has means for sending selective impulses over the line to polarized electromagnets at the sub-stations.

893,132. Cutting Nippers for Removing Insulation from Cables. Hans S. Bork, Randers, Denmark. Application filed May 28, 1907.

These nippers are provided with separate pairs of knives, successively arranged and differently spaced, for cutting the several layers of insulation simultaneously.

893,147. Apparatus for Signaling and Communication to Moving Trains. Henry B. De Groot and William A. Kendrick, Washington, D. C., assignors of one-fourth to Henry Copperthite and three-sixteenths to Charles E. Kendrick, Washington, D. C. Application filed March 10, 1908.

The apparatus comprises a local circuit including a buzzer and battery, a signal circuit including a telephone receiver and a normally open block and means whereby the block may be closed to receive the discharge from the buzzer coil.

893,151. Device for Transmission to a Distance of Sounds Produced by Talking Machines. Eugène Ducretet, Paris, France. Application filed March 4, 1907.

The reproducer trumpet of a talking machine has a supporting rod secured to it substantially parallel to its axis, means for connecting a microphone to the supporting rod and to hold it in front of the trumpet opening in adjustable relation thereto, and means for supplying current to the microphone.

893,160. Electric Switch. David E. Gray, New York, N. Y. Application filed April 26, 1905. Renewed June 29, 1907.

This switch has a switch lever for connecting the contact and terminal members and means co-operating therewith for effecting connections with a number of batteries, either singly, in multiple or in series.

893,163. Coupling for Electrical Conductors. William C. Hafemeister, Cleveland, Ohio, assignor to the Van Dorn Electric and Manufacturing Company. Application filed June 6, 1907.

The coupling consists of two similar members having plane contact faces, each of the faces being provided with a recessed groove and undercut tongue aligned with each other and adapted to register with the tongue and groove on the face of the other member.

893,209. Electrical Heating Vessel. Alonzo A. Warner, New Britain, Conn., assignor to Landers, Frary and Clark, New Britain, Conn. Application filed December 2, 1907.

A vessel for heating liquids comprises a socket having a chamber for an electrical heater and a central hollow stem extending from the socket through the bottom of the vessel and secured thereto with the chamber of the socket underneath the bottom of the vessel.

893,214. Electrically Illuminated Door-knob Mechanism. Henry G. Williams and John A. Spiker, Salt Lake City, Utah. Application filed January 4, 1906.

This is a modification of the knob described in patent No. 893,082.

893,228. Dynamo-electric Machine. Gano S. Dunn, East Orange, N. J., assignor to the Crocker-Wheeler Company, Ampere, N. J. Application filed February 11, 1905.

The special feature is an air-gap section in which the reciprocal of the square of the air-gap length bears a constant ratio to the distance along the armature periphery from a fixed point. (See cut on next page.)

893,244. X-ray Meter. George C. Johnston, Pittsburg, Pa. Application filed June 30, 1906.

An apparatus for measuring radiant energy consists of an electric circuit having therein a meter and a selenium cell, and fluorescent material arranged to cast its light on the cell. (See cut on next page.)

893,249. Telephony. Isidor Kitsee, Philadelphia, Pa. Application filed September 19, 1906.

Means for showing whether a trunk line is idle or busy comprises a local circuit including a source of current and annunciating device for each of the terminal jacks, both of the local circuits being normally closed through the jacks, but adapted to be opened through the insertion of a plug in either of the jacks.

893,250. Telephony. Isidor Kitsee, Philadelphia, Pa. Application filed August 27, 1907.

A trunk line is normally closed through opposing batteries and there is a shunt around each of the batteries, with jacks connected to the shunt.

893,265. Insulator. Augusto Richard, Milan, Italy. Application filed March 18, 1905.

The insulator has two readily separable elements made of porcelain, one element having a projection entering a socket in the other element, and screw-threaded metallic bushings carried by the male and female parts of the elements and cemented thereto.

893,268. Gas Engine. Walter F. Schleichter, Spring City, Pa. Application filed November 9, 1907.

A special electrical ignition device and its control by the governor is described.

893,277. Telegraphone. Harve R. Stuart, Wheeling, W. Va. Application filed July 3, 1907.

In an apparatus for magnetically recording or reproducing sound there is a pair of magnets electrically connected in the same telephonic circuit, a record surface moving past both of the magnets, the magnets being located where the surface speeds are different.

893,278. Telegraphone. Harve R. Stuart, Wheeling, W. Va. Application filed September 24, 1907.

A telephone circuit including a magnet has a battery and a condenser in series with one another bridged or shunted across the magnet. (See cut.)

893,285. Electric Cable Insulator. Edward M. Tompkins, Chicago, Ill. Application filed August 18, 1906.

A petticoat insulator has an axial perforation, a threaded stem arranged to screw on to the end of an carrying member, a number of sectionally wound semi-circular shallow coils, part of these coils being on the stationary member and the remaining part on the movable member.

893,351. Current Director. James F. McElroy, Albany, N. Y., assignor to the Consolidated Car Heating Company, Albany, N. Y. Application filed February 20, 1899.

A current director comprises an operating lever, a series of carbon piles, a solenoid, a retracting spring, a translating device, circuit connections made to the carbon piles and controlled by the spring and solenoid, and poles in the translating device connected with contacts on the lever adapted to engage with the carbon piles respectively.

893,370. Dynamo-electric Machine. Howard H. Ralston, Norwood, Ohio, assignor to the Bullock Electric Manufacturing Company. Application filed November 29, 1905.

A brush yoke adjustably mounted on the frame of the machine carries a number of brush forks, and means operative to permit the forks to be adjusted relative to the yoke laterally and axially of the commutator.

893,382. Electric Circuit Controller. Dane B. Sawyer, Paterson, N. J. Application filed September 24, 1907.

A rod is mounted to slide in a casing and provided with contacts in circuit therewith and spaced apart. There are contacts to coact with the first-named contacts, and a spring to move the rod upwardly.

magnet and means for adjusting the point of action of the magnet according to the conditions of the storage battery.

893,534. Electric-lighting System. James F. McElroy, Albany, N. Y., assignor to the Consolidated Car Heating Company. Original application filed July 28, 1899. Divided and this application filed November 15, 1904.

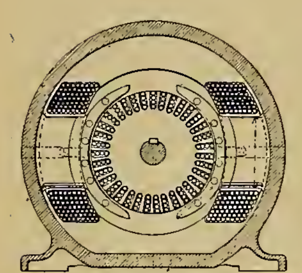
In connection with a variable-speed dynamo, and a storage battery to be charged thereby, is a constant-potential regulator for the dynamo, and means including a series coil between the dynamo and battery for limiting the current flowing to the battery during the charging period. (See cut.)

893,536. Electrodynamic Brake. Frederick W. Newell, Hastings-upon-Hudson, N. Y., assignor to the Otis Elevator Company, Jersey City, N. J. Original application filed November 13, 1905. Divided and this application filed December 5, 1906.

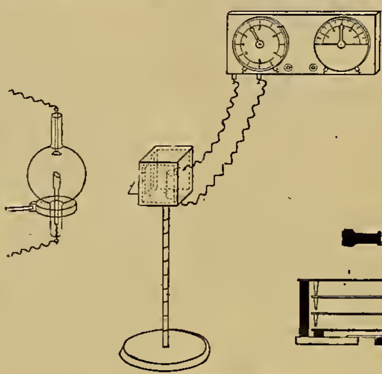
In combination with a motor and controlling apparatus therefor is a differential relay having a winding connected directly across the mains, and means controlled by the relay for effecting a positive stop of the motor when the same acts as a generator.

893,555. Wire Fastener. Cornelius F. Sullivan, Boston, Mass., assignor to Frank W. Lowe, Boston, Mass. Application filed January 29, 1908.

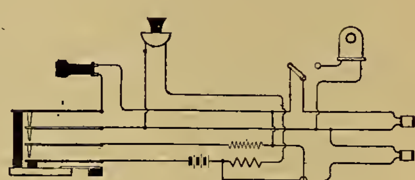
A coupling for two oppositely disposed wire end portions consists of a coiled-connecting wire with which the end portions are telescoped, the coils of the connecting wire being flattened at opposite sides and partially embedded in indentations formed in corresponding portions of the wire end portions.



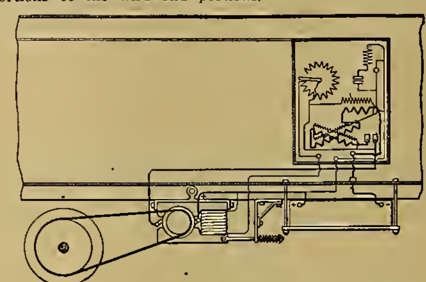
No. 893,228.—AIR-GAP CONSTRUCTION



No. 893,244.—X-RAY METER



No. 893,278.—TELEGRAPHONE



No. 893,534.—CAR-AXLE LIGHTING SYSTEM

electric cable conductor, and a terminal clip for connection with the stem.

893,286. Multiphone. Kelley M. Turner, New York, N. Y., assignor to the General Acoustic Company. Application filed December 21, 1905.

A horn is provided with a block having convergent passages and a number of receivers inset in the passages and connected in a multiple circuit with a pair of transmitters, the transmitters being included in a box having a battery.

893,305. Electromagnet. Herbert W. Cheney, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Original application filed June 8, 1906. Divided and this application filed November 14, 1907.

This solenoid electromagnet comprises a winding, an iron frame extending partly within the same, and a movable core, the inward extension and the core having steel centers to hold the core in attracted position after the magnet is de-energized.

893,314. Magnet-actuated Signal Bell. Harold W. Eden, Detroit, Mich., assignor to the P. R. Manufacturing Company, Detroit, Mich. Application filed July 18, 1906.

The construction of an electric bell mounted on an iron frame is described.

893,319. Cable-raising or Separating Device. Andrew G. Gillespie and William E. Potter, Chicago, Ill., assignors to the American Telephone and Telegraph Company, Boston, Mass. Application filed March 11, 1908.

A switchboard cable-raising implement has a separating bar adapted for insertion between cables and provided with a recess, in which is carried an incandescent lamp.

893,330. Secondary Battery. John Knobloch, New York, N. Y., assignor to Franz Sigel, New York, N. Y. Application filed September 14, 1904. Renewed December 10, 1906.

The element consists of a frame holding a series of tubes, a core of material to become active within each tube, a conductor so convoluted within each tube that certain convolutions will be inclosed by the material while others surround the material.

893,333. Sparking Cut-out for Internal-combustion Engines. Frederick W. Leitenberger, Reading, Pa., assignor to the Reading Standard Company, Reading, Pa. Application filed November 25, 1907.

The device comprises an oscillatingly mounted casing provided with a fixed contact point, a yielding contact finger adapted normally to be swung into contact with the point, and a cut-out fulcrum movably mounted in the casing adjacent thereto.

893,340. Iron-free Variable Inductance. George F. Mansbridge, Sanderstead, England. Application filed March 26, 1906.

This adjustable inductance has one stationary coil-carrying member and one mechanically movable coil-

893,402. Automatic Electric Signal System. Earle Van Briggle, Kokomo, Ind., assignor of one-half to Charles M. Brooker, Kokomo, Ind. Application filed December 10, 1907.

In a signal system for railways there are two circuit closers arranged along the line of way, distant electro-magnetic circuit-closing devices, means whereby the first closer remains inactive until after the second has been actuated, and another circuit closer near the point where the signals are displayed for causing the opening of all circuits.

893,414. Telephone Switching and Signaling Apparatus. James G. Wray, Chicago, Herbert T. Gardner, Maywood, and William G. Kinton, Chicago, Ill., assignors to the American Telephone and Telegraph Company. Application filed July 3, 1905.

The signaling means include a circuit-closing relay in a trunk line and controlled by the operator at the call-originating central station, the relay having an armature to close the generator circuit at one point and a circuit-closing relay controlled by the operator at the central station of the called sub-station for closing the generator circuit at another point.

893,438. Clip for Supporting Electric Cables. John Cæsar, St. Louis, Mo. Application filed November 14, 1905.

A U-shaped single piece of spring metal has two holes near its upper ends for fastening to the messenger wire. The lower part of the clip is inclined and tapered.

893,472. Apparatus for the Recovery of Precious Metals from Slimes, etc. Alphonsus J. Forget, Los Angeles, Cal. Application filed July 21, 1905.

The apparatus comprises a tank, circulating means for causing vortical movement of the material in the tank, and electrodes in the tank extending tangential to the vortical movement, the anodes being formed of lead coated with copper, and the cathodes being of iron and provided with permeable protective coverings.

893,488. Floor-dressing Machine. George F. Hall, Providence, R. I. Application filed February 26, 1907.

This machine is motor-driven.

893,506. Illuminated Alarm Clock. Fritz Ischer, Torrington, Conn. Application filed August 29, 1907.

The clock has an electric lamp for illuminating the dial and a battery located within the case at one side of the works, the frame of the works being concaved and the battery being relatively formed to abut the concave frame.

893,533. Electric-lighting System. James F. McElroy, Albany, N. Y., assignor to the Consolidated Car Heating Company. Application filed July 28, 1899.

An axle car-lighting system is described. It comprises electric lamps and a storage battery, connected in multiple to a constant potential circuit, a variable-speed dynamo, a regulator therefor controlled by a potential

893,565. Electrode. Henry S. Blackmore, Mount Vernon, N. Y. Original application filed April 18, 1903. Divided and this application filed August 31, 1907.

The electrode is composed of a metallic carbon-containing compound and an inviscid, fixed carbon-containing binder.

893,570. Armature-winding Machine. William Cramp, Manchester, England, assignor to the Saxon Engineering Company, Limited, Fenton, Stoke-upon-Trent, England. Application filed September 3, 1907.

The machine consists of upper and lower sets of jaws and end supports carried by pivoted levers, suitably mounted so as to enable a plane coil to be wound and then shifted to open out the coil.

893,580. Method of Treating Sulphide Ores. Wilbur A. Hendryx, Denver, Colo. Application filed November 20, 1906.

This method of treating ores containing copper consists in reacting upon the same with a solution containing a ferric salt and simultaneously separating copper by electrolysis with insoluble anodes, thereby regenerating the ferric salt in presence of the ore.

893,586. Thermal Cut-out. Bryson D. Horton, Detroit, Mich., assignor to the Horton-Morehouse Company, Detroit, Mich. Application filed April 30, 1906.

A main and an auxiliary fuse wire extend through the case from end to end. The auxiliary wire includes an indicator and a spring for drawing this wire away from the cap when the wire breaks.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired July 21, 1908:

456,172. Method of Measuring Electric Currents. E. Thomson, Lynn, Mass.
456,182. Electric Lock. A. S. Wiley, Detroit, Mich.
456,250. Insulated Contact for Electric Switches. O. S. Platt, Bridgeport, Conn.
456,252. Connector and Support for Trolley Wires. S. H. Short, Cleveland, Ohio.
456,253. Operating Mechanism for Current Regulators. S. H. Short, Cleveland, Ohio.
456,254. Switch for Electric-car Motors. S. H. Short, Cleveland, Ohio.
456,271. Flexible Conduit for Electric Conductors. C. H. Herrick, Winchester, Mass.
456,280. Rheostat. J. Van Vleck, New York, N. Y.
456,325. Secondary Electric-clock Movement. B. Haberthur, Breitenbach, Switzerland.
456,327. Cut-out for Electric Lamps. W. F. Smith, Philadelphia, Pa.
456,376. Conduit for Electric Cables. M. Delafor, Paris, France.
456,507. Magnetic Separator. H. G. Fiske, New York, N. Y.
456,513 and 456,514. Electric Railway. R. M. Hunter, Philadelphia, Pa.
456,540. Method of Welding by Electricity. J. H. Bassler, Myerstown, Pa.
456,541. Method of and Apparatus for Electric Welding. S. Lloyd Wiegand, Philadelphia, Pa.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, AUGUST 1, 1908 No. 5

COKE OVENS OPERATED ELECTRICALLY

By Frank C. Perkins

In order to reduce the cost of operation in modern processes every form of labor-saving device is carefully considered and used wherever found practical. Electrically operated coke ovens have been employed in the yards of the Wynn and Phillips plants of the H. C. Frick Coke Company of Pittsburg, Pa., as well as in those of the Orient Coke Company and of the Taylor Coal and Coke Company of Uniontown, Pa. In these yards may be seen examples of the coke-charging, drawing and loading machines, which are among the most important and efficient of electrically operated apparatus in use in this particular field of manufacture.

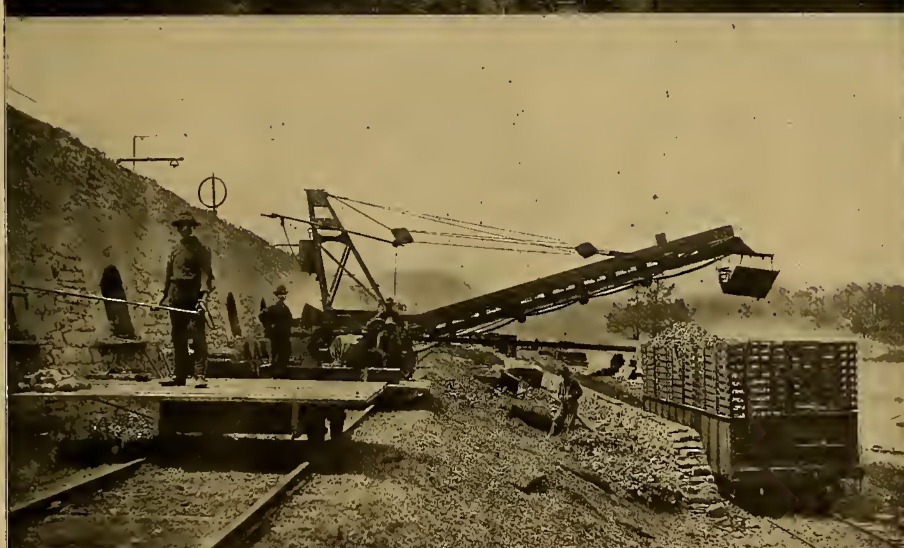
Each machine is said to do the work of 20 men, while requiring only one-fifth that number of men to operate it, and one apparatus will draw the contents of from 35 to 50 beehive ovens, screen the material and load it ready for shipment in 10 hours. It is evident that these machines are of value in reducing the amount of hand labor required Among the other advantages may be mentioned the fact that it is necessary to have an oven open and exposed to the air only half an hour, from the time the quenching of the coke begins until the oven is ready to be recharged, while from two to three hours are necessary where this work is done by hand.

By the use of electric-driven coke-drawing machines the conservation of heat is so great that in a machine-drawn oven the blaze will be produced at the tunnel head in a quarter to half an hour from the time the oven is recharged, so that this insures the full 48 or 72 hours, as the case may be, for burning. This compares very favorably with the time an oven burns when hand drawing is employed.

The accompanying illustrations show the Covington combined coke-drawing and loading machines in operation. The device consists of two principal parts—an extractor for withdrawing the coke from the ovens and a conveyor for screening and loading it into cars. The two parts are mounted on separate trucks, and connected by a drawbar, so that the conveyor travels with the extractor as the latter moves up and down the track. The frame of the extractor consists of a single heavy casting mounted on four wheels keyed fast to the axles, which are driven by bevel gears. A steel ram bar carried in a swinging carriage so as to reach either side of the oven is supported on this frame and is provided at the end with a wedge-shaped, chilled cast-iron shovel, thin at the front and high at the back. This ram-bar has teeth on the side and is driven forward or backward by a steel pinion mounted on a vertical shaft. The swinging carriage is turned in either direction by means of a screw and hand-wheel.

It is stated that the length of the ram and the power employed are sufficient to force the ram under the coke to the back of the oven. By reversing the motion of the gearing, the shovel is withdrawn from the oven with its load of coke. The ram acts like a wedge, raising and parting the coke so as to cause it to fall in the manner described. The motor, which is of the street-railway type, is simple and easily operated. The machine can be moved forward or backward on its track and the carriage sustaining the ram can be revolved on its central axis, allowing the ram to be introduced into the oven at any angle, so as to reach any part of it.

In operation the central portion of the coke is drawn first, and then the ram carriage swung on its axis so as to draw the coke on either side of the central line. While it is possible to reach any part of the oven by the arrangement above described, there will always remain in the oven a small quantity of coke, which is most expediently removed by hand. This is readily accomplished by a workman who follows the machine to clean out this remnant and to put the oven in shape to receive the new charge.



Coke-oven Yard with Electric Charging Machines
Electric Coke-oven Charging Machine in Operation
COKE OVENS OPERATED ELECTRICALLY

It will be noted from the illustrations that the coke when drawn falls on a conveyor, which, as before stated, is carried on a separate truck, and operated by a separate motor. This conveyor is divided into two sections, one of which, traveling along in front of the ovens, is composed of overlapping slats which make a close traveling apron on which the coke is deposited when drawn from the ovens, and which in turn deposits the coke on a second apron formed with slats having openings between them. These slats are usually convex on the upper surface, and the openings between them allow the dust and ashes to fall through, so that only clean, merchantable coke is deposited into the cars. The machine has an extension on the conveyor, which runs along in front of the ovens, so that while the machine is drawing one oven, the small amount of coke remaining in the first oven may be pulled directly onto the conveyor.

Practically all the machines in the field today are electrically driven. Motors of 20 horsepower are used to operate the extractor, and either 10 or 15-horsepower motors are used to drive the conveyor.

On some of the machines a new power device is used instead of the hand-wheel for turning the screw which operates the ram carriage. It has been found that when drawing 40 or more ovens daily, the work of operating the hand-wheel continuously is too hard for one man, so that two are necessary, taking turns at relieving each other. With the arrangement mentioned, however, the operator can sit down instead of standing, and draw 40 or more ovens per day with greater ease than can the two men working the hand-wheel.

The statement has been made that in one plant at Uniontown, Pa., these machines have drawn 45,000 ovens without having lost a single oven due to the fault of the electric-driven machines.

EXPOSED INCANDESCENT-LAMP BASES

The National Electrical Code prescribes that no live parts of an incandescent-lamp base shall be exposed when the lamp is in the socket. Electrical manufacturers and underwriters have co-operated for several years for the establishment of standards whereby this result has been accomplished for the bases of common carbon-filament lamps. The newer high-efficiency lamps, such as the tantalum and tungsten require a metal extension or "skirt" over the bulb beyond the Edison screw base. Designs have been developed and adopted by American manufacturers for constructing these high-efficiency lamps in such a manner as to insulate this skirt from current-carrying parts of the base and so secure in these types the same degree of protection as that already obtained for the older patterns. Some of the foreign manufacturers are, however, supplying lamps having exposed skirts not insulated from the circuit. Mr. W. H. Merrill, manager of the Underwriters' Laboratories, Chicago, calls attention to the desirability of giving preference to lamps having no live metal parts exposed when placed in the standard socket, which has a depth of fifteen-sixteenths inch in a vertical plane from the bottom of the center contact to the upper edge of the outer socket shell or wall.

It is interesting to note, as one may by this warning, how the advancement of the art brings with it unexpected hazards.

ELECTROMAGNETIC MEANS FOR TESTING WIRES OR WIRE ROPES

Quite an ingenious application of the principle of electromagnetic induction has been made in a recently patented device invented by Charles E. S. McCann of Johannesburg and Richard Colson of Belfast, Transvaal. It relates to means for testing wires or wire ropes, or for indicating variations in the cross-sectional area of wires, wire ropes, rods or bars of metal, owing to faults in the manufacture of the same, to deterioration during use, or from other causes.

The device is designed especially for testing the wire ropes or cables employed in mine hoisting and hauling apparatus, in which a considerable decrease in the cross-sectional area usually takes place before breakage. In order to detect this reduction in the cross-sectional area of the rope and the consequent weakening of the same, it is now necessary to force open the lay of the rope in order to inspect it. This is extremely undesirable for the reason that the wires of the rope are liable to be broken and elongated (causing a further reduction in the area) and the rope distorted in the operation.

The inventors have provided an instrument by means of which the absolute cross-sectional area

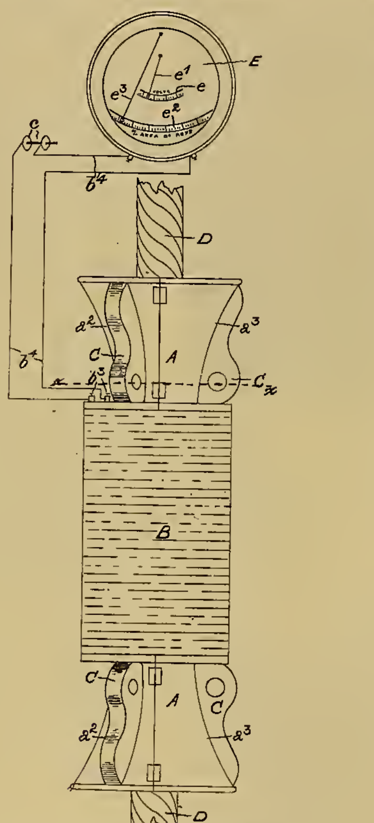


FIG. 1. COIL AND INDICATING INSTRUMENT FOR TESTING WIRE ROPES

of the rope in detail and throughout its entire length is indicated or recorded. The method consists essentially in the employment of an electromagnetic coil, through the hollow center of which is passed the wire rope to be tested. Through this coil is passed an electric current, which may be either an interrupted or an alternating current. In the circuit is interposed an instrument which serves for indicating or recording, or both, any variations of the electric current passing through the coil, which are caused by any variations in the cross-sectional area of the wire rope, or the like, by means of electromagnetic induction.

Referring to the arrangement shown in Figs. 1 and 2, (A) represents the spool or former, which may be made of brass or any non-magnetic substance or material, round which is wound a coil (B) of insulated wire, preferably compounded and taped to render it waterproof. The spool has formed through it longitudinally a hole or passage which is of such a size as to leave a suitable amount of clearance between the interior walls and the rope (D) as the latter passes through it. This passage is made flaring or bell-mouthed at the ends so that it will catch any broken strands or wires and deflect them through the spool, thereby preventing damage to the rope. The spool is provided with perforated lugs or projections (C) which serve for suspending or otherwise securing it in position, so that the rope may run freely through it.

In the construction shown the spool is made in halves (a^2) (a^3), and on each half are lugs, in which are formed coincident holes adapted to receive a stud or bolt (a^4) which serves for bolting the halves of the spool together. The coil (B) is also severed along the plane of cleavage of the spool and the severed ends of the wires of one part of the spool are adapted to project into tubular sockets attached to the ends of the wires on the other part of the spool. Any other suitable means may be provided so long as suitable connection is made between the ends of the wires of the coil to permit the current to flow through it. Between the halves of the spool is placed insulating material represented at (a^5). By this construction it is possible to clamp the testing coil round the rope instead of passing the end of the rope through it. To the terminals (b^3) of the coil are attached the wires (b^4) connecting to (c), the source of electric energy.

In the arrangement represented in Fig. 1, there is an indicating instrument (E), which is interposed in the electric circuit. The instrument is graduated as indicated at (e), to indicate appropriate electrical units. Another scale (e^2) is marked with decimals of an inch for indicating the variations in the cross-sectional area of the rope to be tested. This instrument may be constructed like an ordinary milliammeter or be of any other suitable construction. The gauge of the insulated wire and the number of times it is coiled round the spool are varied to suit the size of the rope to be tested and the design of the recording instrument.

Means of suspending or supporting the testing coil are provided by attaching through the holes in the three peforated lugs (C) three coiled springs, which latter are attached at their other extremities to a triangular frame. A similar frame and springs are provided for the other end of the spool. The triangular frames may be rigidly connected in any suitable manner. This means of suspension allows the testing coil to yield to or to follow the play or swing of the rope without undue wear. The coil may be suspended either by means of two of the frames, or otherwise, in such a position, say, in close proximity to the head-gear sheave, as shown at (B) in Fig. 3, that there is a minimum of vibration.

In Fig. 3 is shown the apparatus as designed to work in conjunction with a recording instrument. In this construction (F) represents the headgear of a mine and (f) the headgear pulley or sheave round which the hauling rope (D) passes to the winding drum (f^1) of the hauling engine (f^2), of which (f^3) represents the piston rod and (f^4) the connecting rod driving the drum. By (f^5) is represented the lever actuating the reversing gear of the engine and by (G) the indicator geared from the winding drum, which serves for indicating at any time to the engine driver the position of the skip in the shaft of the mine.

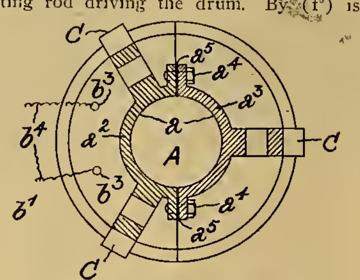


FIG. 2. SECTION ACROSS TESTING COIL ON LINE X-X OF FIG. 1

The testing coil is shown at (B) in position for the hauling rope to pass through it as it passes over the pulley sheave. The suspension previously described is not shown, so as to obviate obscuring the other parts. At (c) is represented the source of electric supply, and (b^4) represents the wires placing the testing coil in series with the indicating instrument, the indicator (G) and reversing gear.

A recording instrument (H) is shown in connection with this figure and drawn to an enlarged scale compared with the other parts. It consists of an instrument (H^1) which works on the principle of an ammeter and has its pen or pointer (h) moved by the current flowing through it in series with the testing coil, and a voltmeter represented at (H^2) actuating a recording pen (h^1) simultaneously with the recording pen (h) of the ammeter (H^1) to enable any errors in the record made by the ammeter due to fluctuations in the pressure of the current to be corrected. The ammeter and

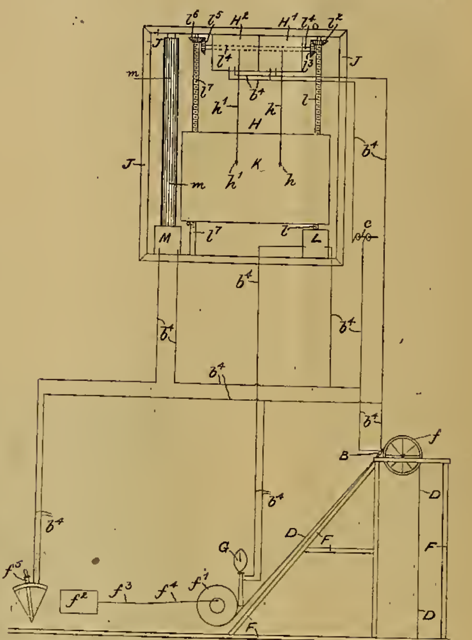


FIG. 5. APPARATUS FOR TESTING WIRE ROPES IN A MINE SHAFT

voltmeter are arranged in the upper portion of a rectangular casing (J), and their pens are arranged to record on a chart or reel of paper (K). This is adapted to move vertically inside the casing to indicate the condition of the rope and also to be moved horizontally so as to separate the different trips or ascents and descents of the skip or cage in the shaft or to indicate the reversal of the direction of travel of the rope through the testing coil. This is effected through the medium of the reversing gear. The vertical travel of the chart represents to scale the total travel of the hauling rope in the shaft, and this vertical motion of the chart, being imparted by impulses of current sent through a make-and-break contact actuated by the indicator (G), maintains the chart in relation to the pen (h) at the same relative position as the rope to the testing coil.

Under normal conditions, that is to say, assuming the voltage or pressure to be constant and the rope to be of uniform cross-sectional area, then the two pens would make two parallel vertical lines on the chart from top to bottom, representing a complete trip down the shaft. The reversal of the engine by means of the reversing gear then imparting through a suitable make-and-break contact a horizontal movement of the chart, and the indicator simultaneously reversing the direction of travel of the rope, would under the same conditions cause the two pointers to mark two parallel vertical lines on the chart from the bottom to the top. In the event of any variation in the pressure or voltage of the current this would be indicated by the pen (h^1) of the voltmeter, and producing a corresponding effect on the ammeter, would enable the reading of the latter to be correspondingly corrected. Assuming the voltage or pressure to remain constant, then any reduction in the cross-sectional area of the rope would be indicated by the line made by the pen of the ammeter deviating from the vertical.

For the purpose of effecting the vertical movement of the chart there is employed a clockwork mechanism of a suitable construction arranged within a casing represented at (L). The escape of this clockwork or mechanism is worked by a suitable electromagnetic device actuated by make-and-break mechanism operated through the medium of the depth indicator of the engine. The mechanism drives a vertically disposed screw-threaded spindle which works through screw-threaded holes in the rectangular frames carrying the rollers on which the chart is mounted. On the upper end of this screw-threaded spindle is fixed a bevel wheel (l^2) which gears with the bevel wheel (l^3) on one end of a horizontally disposed spindle, on the other end of which is fixed another bevel wheel (l^3). This engages another bevel wheel fixed to the top of another vertical and parallel screw-threaded spindle (l^7). By providing the two screw-threaded spindles and gearing them together in the manner described, it insures both ends of the frames being positively and synchronously raised and lowered.

To effect the horizontal movement of the chart there is provided another clockwork mechanism located in a casing (M). This clockwork has its escapement worked by an electromagnetic device actuated by make-and-break mechanism under the control of the reversing gear. This mechanism drives a long pinion or toothed spindle (m) which meshes with gears (not shown) that drive the vertical rollers on which the chart is mounted. Each reversal of the engine imparts through the toothed spindle rotary motion to these rollers, and so advances the chart, irrespective of the position of the latter, at each reversal. The chart being moved simultaneously with, and proportional to, the movement of the rope, enables the length or levels of the different trips to be ascertained, and thus the exact number of lifts, hauls or winds is recorded.

INTERNATIONAL ELECTRICAL CONGRESS AT MARSEILLES

The International Congress of the Applications of Electricity will be held at Marseilles, France, September 14th to 20th. The Marseilles electrical exposition, which is now being held in the Prado Park, and will continue until October 31st, is one of the largest exhibitions of electrical machinery and apparatus ever collected on the Continent, and the International Electrical Congress has taken advantage of this occasion for its meeting.

The sessions of the congress, which has for its purpose the examination of technical and commercial problems, will consist of reports and discussions by leading authorities on the questions up for debate. Many courtesies will be extended to attending members of the congress. French railroads and steamship lines promise substantial reductions in fares, and the freedom of the electrical exposition is granted to members during the convention.

Applications for membership in the congress may be made, accompanied by the equivalent of 20 francs (about $4), by addressing the treasurer of the International Electrical Congress, 63 Boulevard Haussmann, Paris. Members will receive a complete report of the convention.

The programme of the sessions of the congress is divided into sections, which will treat such special subjects as the legal aspects of electrical operations, the construction and operation of electric lines, commercial and technical exploitation, applications of electricity to industrial, mining, traction, agricultural and domestic purposes, electrochemistry and metallurgy, telephony and telegraphy, standards and measures, and electrotherapeutics.

Among the well-known engineers who will present papers are the following, with their subjects: "Telephonic Communication Over Lines on Power Transmission Poles," G. Laporte; "Electrical Installation on Shipboard," Gaston Roux; "Electrical Illumination," A. Blondel; "Comparison of Traction Systems," Eduard Tissot; "Electrotechnical Schools," Paul Janet.

ELECTRICAL EQUIPMENT OF A GREAT LUMBER MILL

One of the most impotant of recent electrical installations for industrial purposes is that completed by the Great Southern Lumber Company, at Bogalusa, La. The importance arises not only from the fact that this is the first installation of this kind in that section of the country, but because it is the largest electrically equipped woodworking plant in the world.

The great capacity of this plant has made it necessary to cover a large area, consequently considerable of the woodworking machinery is located at such a distance from the main saw mill that the transmission of power would be almost impracticable through any other means than by the application of electric motors. The distribution of power could have been accomplished by cable transmission, or the various mills could have been operated by independent steam plants, but the low efficiency of such methods of drive was objectionable in this case.

A practical mill man will readily understand that there are a large number of complications required where rope transmission is used and that such a system only multiplies the use of belts, pulleys, hangers, etc., as well as to the cost of help necessary to keep such apparatus in working order.

The installation of several steam plants, including the costs for boilers, steam engines, pumps, piping, etc., may not be considered as being prohibitive in the matter of first cost, but the expense of maintenance, including insurance and the cost of labor connected with these separate steam installations, makes such applications expensive and the plant a source of worry and annoyance to the management.

The electric drive, when properly installed, does away with long lines of shafting and multitudes of hangers, journal boxes, etc., which have to be continually looked after and kept in repair. It further does away with a great number of expensive belts, which frequently break and have to be renewed or retightened, owing to various conditions which must be anticipated.

It is not possible to eliminate all belting in a woodworking plant where electric motors are used. For example, the small machines in the filing room may be grouped so that several operate from one motor, or the lumber sorters, blowers and stackers may require short lengths of belting; but even in this case long lines of shafting and gearing may be eliminated. The excellent arrangement and consequent economy of operation of this plant secured by direct drive is in a great part due to the efforts of Mr. G. U. Borde of New Orleans, who acted as consulting engineer for the company.

The entire 1,500 horsepower for use about the mill is generated at a central point by General Electric generators and is distributed through cables to motors located at the machines to be driven. Fig. 1 shows the general layout of the plant. The three alternating-current generators, direct-driven by slow-speed engines and delivering current to the line at 2,300 volts, are excited by current from two direct-current marine-engine sets, shown in the foreground of Fig. 2, page 78. The current is carried to the mill through cables in underground conduits. The heavy black line running to the left from the power house *A* in Fig. 1 shows the course of the underground conduit supplying the two planing mills, sorter and stacker, and ending with the 42 motors in the main planing mill.

The woodworking machinery, furnished by the Berlin Machine Company, as well as the auxiliary apparatus and sizes of motors, is listed in the following table:

Planing Mill No. 1

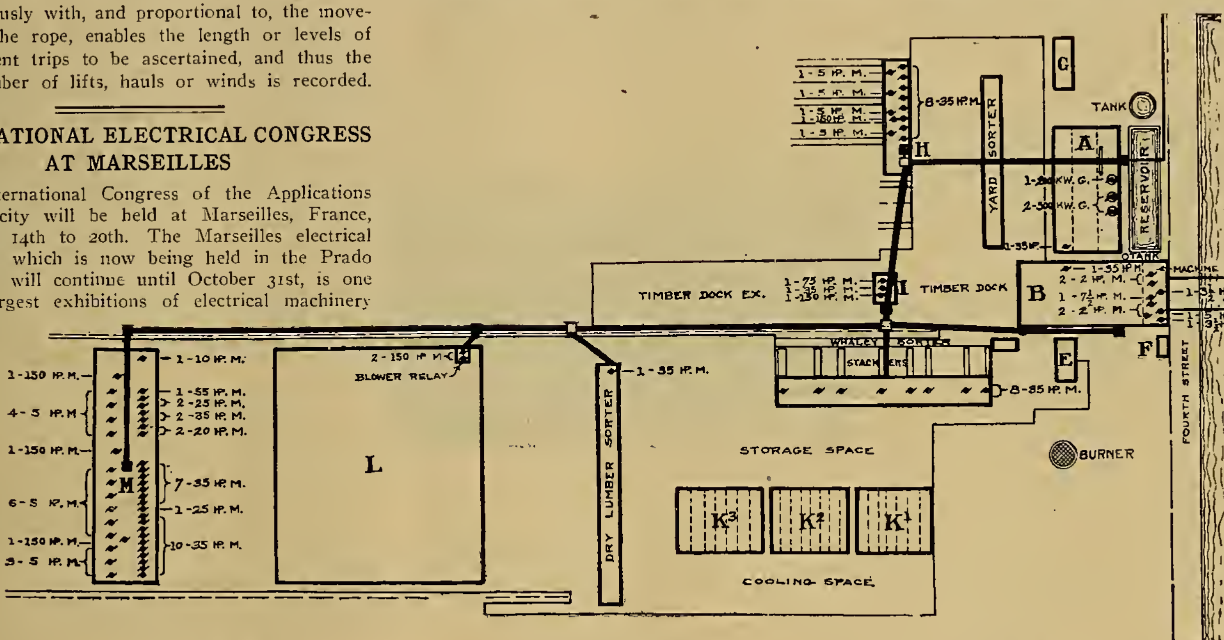
Thirteen 16-inch No. 238 trim saws, each direct-coupled to a five-horsepower, 1,200-revolution motor.
Seventeen No. 94 planers and matchers, each direct-coupled to a 35-horsepower, 900-revolution motor.
Two No. 266 three-saw gang edgers, each belted to a 35-horsepower, 900-revolution motor.
One 64-inch No. 285 band rip saw, direct-coupled to a 55-horsepower, 514-revolution motor.
One 44-inch No. 283 band rip saw, direct-oupled to a 25-horsepower, 600-revolution motor.
One 44-inch No. 281 band rip saw, direct-coupled to a 25-horsepower, 600-revolution motor.
One 30-inch No. 177 double surfacer, direct-coupled to a 35-horsepower, 900-revolution motor.
Three double 70-inch Sturtevant blowers, each direct-belted to a 150-horsepower, 600-revolution motor.
All machinery in the filing room is connected with line shafting, belted to a 10-horsepower, 1,200-revolution motor.

Planing Mill No. 2

Eight No. 94 planers and matchers, each direct-coupled to a 35-horsepower, 900-revolution motor.
One 44-inch No. 281 band rip saw, direct-coupled to a 25-horsepower, 600-revolution motor.
Four 16-inch No. 238 trim saws, each coupled to a five-horsepower, 1,200-revolution motor.
One double 70-inch Sturtevant blower, direct-coupled to a 150-horsepower, 600-revolution motor.

Planing Mill on Timber Dock

One 30-inch by 20-inch No. 1 timber sizer, direct-coupled to an 85-horsepower, 900-revolution motor.
One No. 94 planer and matcher, direct-coupled to a 35-horsepower, 900-revolution motor.
One double 60-inch Sturtevant blower, direct-coupled to a 150-horsepower, 600-revolution motor.



A—Power House
B—Saw Mill
E—Lath Mill
F—Blacksmith Shop
G—Turpentine Plant
H—Planing Mill
I—Planing Mill
K¹, K², K³—Kiln Batteries
L—Rough Lumber Shed.
M—Main Planing Mill
Scale—5-16 Inch = 100 Feet

FIG. 1. PLAN OF BOGALUSA PLANT OF GREAT SOUTHERN LUMBER COMPANY

Dry Lumber Sorter

Dry lumber sorter, driven by one 35-horsepower, 900-revolution belted motor.

Lumber Stackers

Eight lumber stackers, driven by eight 25-horsepower, 600-revolution belted motors.

Fuel Conveyors

Two fuel conveyors, driven by two 35-horsepower, 900-revolution belted motors.

FIG. 2. POWER PLANT AT BOGALUSA LUMBER MILL

Centrifugal Pumps

Two 14-inch centrifugal pumps, for pumping into log ponds, each direct-coupled to an 85-horsepower, 720-revolution motor.

Machine Shop

One two-horsepower motor, connected to upright drill.
One two-horsepower motor, connected to bolt cutter.
One 7½-horsepower motor, connected to planer.
One two-horsepower motor, connected to pipe machine.
One two-horsepower motor, connected to pipe machine.
One 3½-horsepower motor, connected to shaper.
One five-horsepower motor, connected to radial drill.
One 3½-horsepower motor, connected to machine lathe.

Relay Blower Stations

Two double 70-inch Sturtevant blowers, belted to two 150-horsepower, 600-revolution motors.

GENERAL CHARACTERISTICS

Transformers inside the mills reduce the pressure to 440 volts, at which potential the motors driving the various mill machines are operated. All of the machines in the three mills of this plant are driven by General Electric Form K induction motors, which, on account of their simplicity and sturdiness, are especially suited to this class of work. Moreover, the electric motor of such sizes as are used in this work is essentially a high-speed, high-efficiency machine, making it not only possible but highly desirable to connect this direct to the shaft of the machine to be driven. This has been done

FIG. 3. BAND RESAW DIRECT-CONNECTED TO 55-HORSEPOWER INDUCTION MOTOR

in all except a few instances, as the higher efficiency obtained with the absence of long belts and lines of overhead shafting more than justifies the extra first cost for individual motors. Swing saws, planers, matchers and band saws are all connected direct to the driving motor. This makes the lighting remarkably good, as it does away with all the overhead shafting and belts, and at the same time gives an installation of remarkable flexibility. The good lighting and entire absence of belts is well shown in Fig. 13, which illustrates the direct motor drive to one of the Berlin band rip saws.

The dust, which is generally such an obstacle to the satisfactory operation of planing mills, is removed by electric power. Seven double blowers are driven by 150-horsepower motors drawing the dust up through a system of pipes. These blowers are distributed through the mill as follows:

One in each of the small planing mills *H* and *I* shown in the diagram, two in the rough-lumber shed and three in the main planing mill. About eight ounces pressure is maintained by these, which not only carries away dust and fine shavings, but also knots and large chips. One of these blowers is shown in Fig. 4 and the arrangement of the pipes is well shown in Fig. 3.

Fig. 5 illustrates an 85-horsepower motor connected to a timber sizer and gives a good idea of the simplicity and compactness of this form of drive. This sizer is in the planing mill on the timber dock, as shown in the diagram.

Each of the motors is supplied with a starting device and protecting fuses at the motor, so that each machine is a plant in itself and practically independent of the other machine. Fig. 6 shows one of these starting compensators connected to a motor driving a band edger. The fuses at each machine protect that motor and its cable from internal injury, and as the cables are encased in iron conduits fire danger is eliminated.

The entire installation is high class. The economical methods of handling lumber and the cleanliness and flexibility secured by the improved methods are making the dusty sawmills of the past more and more uncommon.

ELECTRICAL MANUFACTURING IN ENGLAND

There has been much searching of hearts in England to explain the reason for the long-continued depression in the electrical manufacturing

FIG. 4. BLOWER BELT-CONNECTED TO 150-HORSEPOWER INDUCTION MOTOR

industry in that country. The London Times has published considerable correspondence on the subject. One of the letters is from Mr. T. C. Elder, who asserts that the root of the trouble is economic rather than technical and who declares for protection. A portion of Mr. Elder's letter, in which reference is made to the industry in the United States, is as follows:

"During the inquiry conducted by the Institution of Electrical Engineers in 1901, Mr. Philip Dawson brought in evidence figures showing that in central-station plant our total exceeded that of Germany. But Mr. Dawson also stated that out of 200,000 kilowatts installed, 71,000 kilowatts of generating capacity was of American make. He did not give the figures showing what proportion was of German origin, but the balance left for the British firms could not have been more than half the central-station capacity then installed and manufactured in Germany—viz., 170,000 kilowatts—and in obtaining their share the British manufacturers had, of course, to cut their prices to meet foreign protected competition.

"Confining our survey merely to the territory of those countries, we see that America and Germany have a market more than twice the size of that open to our own manufacturers. We are not permitted to pursue business in America or Germany, and we have to struggle hard to obtain a share of the contracts in our own country. If there were no actual facts available, the first principles of modern economics would teach us that without some measure of protection we cannot possibly attain either the magnitude or the prosperity of the American and German electrical manufacturing industries."

Platinum, which sold at $40 an ounce a year ago, is now quoted at just half as much, $20 an ounce. The metal sold as low as $8 to $10 an ounce 15 years ago. Nearly all platinum comes from the Ural Mountains, and the government of Russia keeps close control of the mines.

TEST OF GAS-ELECTRIC POWER PLANT

By J. R. BIBBINS

In this paper an attempt is made to present a general study of a problem upon which only very limited data seem to be available—power generation by gas-engine-driven plants, its commercial efficiency and ultimate cost. I think it best to approach the subject from the operating standpoint, basing calculations upon actual working results from a specific case, one of demonstrated fact. The 30-day test on the service plant of the Richmond works of the American Locomotive Company, Richmond, Va. (presented by courtesy of Mr. William Dalton,

FIG. 5. TIMBER SIZER DIRECT-CONNECTED TO 85-HORSEPOWER INDUCTION MOTOR

chief engineer of that company), is conclusive in this respect. Although somewhat limited in scope (being only a commercial test), it nevertheless provides a starting point for further deductions. While of a somewhat cursory nature, it is hoped the data presented will serve at least to emphasize the wide field of the modern gas-power plant.

THE RICHMOND PLANT.

The equipment consists of a 23.5 by 33-inch horizontal, tandem gas engine, with a direct-connected, direct-current generator, operating on producer gas generated by a pair of nine-foot bituminous producers. The gas is purified by means of wooden slat scrubbers and centrifugal tar extractor, motor-driven. A 15,000-cubic-foot holder serves to equalize its quality and to start the engine, which is necessary to bring the motor-driven auxiliaries into service. The engine is of the modern double-acting type, giving two impulses per revolution, and is governed by a sensitive oil relay system designed to relieve the governor of all valve work. Employing the constant-quality method, the ratio of air to gas is constant except when the gas itself changes, for which event hand-regulating dampers are provided. Duplicate igniters work together for increased security. For the same reason duplicate sources of igniter current are available—motor-generator and lighting mains. An important feature of the producer is that it is designed for continuous operation, having a water-sealed bottom instead of a closed ash pit, to permit the removal of ash at any time. It generates its own steam, requiring no auxiliary boilers, so that the only auxiliaries required for the entire plant are a motor-driven fan, tar-extractor and igniter set. In the aggregate these auxiliaries absorb about five per cent. of the station capacity.

The Richmond works employ motor drives to a

FIG. 6. MOTOR-DRIVEN BAND RESAW, SHOWING MOTOR STARTER

considerable extent, and for such diversified purposes that the individual demands superpose to a large degree and yield a fairly constant total. This is a condition conducive to the most efficient working of a gas-power plant, and influenced to some extent the choice of this form of motive power in this particular location. Constituting the main service plant of the Richmond works, it is called upon for continuous 24-hour service, except on Sundays and holidays.

Herein lies one essential requirement for a producer-plant test. Owing to the comparatively long period required for a pound of fresh coal to work through a fuel bed several feet deep, a long test is necessary for any degree of accuracy. With the

1. A paper presented at the annual convention of the American Institute of Electrical Engineers, Atlantic City, July 1, 1908.

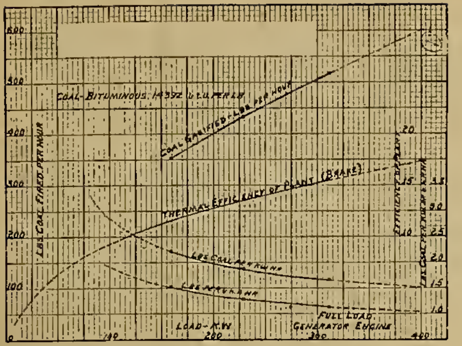


FIG. 1. GAS POWER PLANT ECONOMY AT VARIOUS LOADS

rapid combustion on a boiler grate, this is a different matter, and an 8-hour or 10-hour test will suffice. But in producer work, 24 hours, or 48 hours, is the minimum. In this case, the test was continued for practically four weeks, half of the time on a full-load run and the remaining two weeks to three-fourths and one-half load, respectively, with a rate of gasification of 0.25 ton per hour. A continuous run of 223 hours' duration evidently provides an excellent guarantee of accurate results.

The Test

From the great mass of data recorded during this test, it will suffice to extract only such as pertain to the operation of a plant of this nature. The test was conducted entirely by the company's engineering and operating staff, and for the purpose of determining the fulfillment of guarantees. The electrical output was measured by direct-current recording wattmeters calibrated from a laboratory standard previous to the test. The water consumption was also metered, no great accuracy being desired. The coal was weighed by scales checked from time to time by standard weights.

Samples from such weighings, accumulated during a day's run were quartered down and sealed for analysis, Table I.

Table I.—General Results of Test.

Nominal Load.	Full.	Three-Quarters.	One-half.
Length of run. hours	223	125	136
Average load, kw	312.3	228.3	159.6
Average load, computed boiler hp.	455.0	333.0	338.0
Load, per cent. engine rating	91.0	67.6	47.5
Load, per cent generator rating	104.0	77.2	53.2
Coal gasified, lbs	115.289	54,143	47.775
Coal gasified, per hour	517.0	433.0	351.0
Output, kw-hr.	69,650	28,540	21,710
Pounds coal per kw.-hr	1.654	1.697	2.20
Lbs. coal per kw.-hr, guaranteed.	1.93	2.10	2.64
Pounds coal per boiler hp.-hr	1.14	1.31	1.56
Average heat value of coal, B.t.u.	14,392	14,392	14,392
B.t.u. per kw.-hr	23,700	27,280	31,6?0
B.t.u. per boiler h.p.-hr	16,415	18,710	21,670
Per cent. thermal efficiency, brake	15.51	13.6	11.75
Per cent thermal efficiency, elec.	14.35	12.65	10.78

Coal.—Pocahontas run-of-mine; average heat value dry sample, 14,703, as fired, 14,392; volatile matter, 22.8 per cent, ash 4.5 per cent, sulphur 1 per cent.
Test—August 12. 7 a. m., to September 7, 12 m.

It should be noted that at full load, 312 kilowatts, the engine was running somewhat below full rating, but the true full-load coal consumption may readily be found. For this purpose, these data have been plotted in Fig. 1, in the form of three related curves: (a) Rate of gasification in pounds per hour; (b) pounds per unit of output per hour, and (c) corresponding thermal efficiency. The first-mentioned curve is important in all analyses of steam or gas engines to determine the rationality of the results for the line of heat input to the engine as well as to the producer should be practically straight, as developed during the test of a similar engine at the works of the Norton Company. The second curve, showing the relative fuel economy at variable loads, necessarily follows the form of an equilateral hyperbola, being derived from the line of total coal input. Finally, the third curve, efficiency, represents that part of the heat in the coal that has been converted into useful work. This is absolute or kinetic efficiency, and not akin to the "efficiency ratio" employed in steam-engine practice. It covers all losses between coal pile and switchboard.[1] It is found that the gross coal consumption of the plant at full engine load is 550 pounds per hour, or 1.59 pounds per kilowatt-hour, equivalent to approximately 1.09 pounds per boiler horsepower-hour. And with 400-kilowatt load, which is easily within the limits of this particular plant, the coal consumption would be roughly 1.5 pounds per kilowatt-hour, or 1.0 per boiler horsepower-hour.

This characteristic of constantly increasing economy shown by the gas-engine plant up to the point of maximum load illustrates an essential difference from steam-engine economy which usually is best at loads 70 to 80 per cent. rating, according to the cylinder ratios employed. Although the gas-economy curve is quite flat beyond half-load, yet the plant evidently does its best work well loaded. By projecting backward the line of total coal gasified, we find that it requires over one-third of the full-load coal to run the plant unloaded. This represents a standing charge against its operation, becoming less and less important as the load increases. Barring this constant loss, this plant would be capable of generating power at the rate of one pound of coal per kilowatt-hour, which rate would, moreover, be constant at all loads. In other words, additional load might be acquired at this rate by providing for the constant losses as a fixed charge. This method is actually employed by some central stations in determining power rates.

During the four weeks' test, there were several days during which the plant was allowed to stand idle, as the works are not operated Sundays. During this period some coal was required to keep the producer fires at their normal level and in good condition. It would, of course, have been possible to starve the fires during standby periods, but this would simply have resulted in a higher coal consumption during the succeeding run. According to the judgment of the producer operator, an average of 1,700 pounds of coal were required to compensate for standby losses from 6 p. m. Saturday until 7 a. m. Monday, a period of 37 hours. Herein lies a remarkable feature of the producer plant—the low rate of standby losses, averaging only 46 pounds per hour, or 2.5 per cent. of the weekly coal consumption.

Carrying this analysis one step further, Fig. 4 shows a graphical method of determining the producer-plant efficiency. Here are plotted three economy tests and the standby loss. Not knowing the heat input to the engine at various loads by actual test, the guaranteed efficiencies have been plotted extending the line backward to a point of zero input. This corresponds to 166 kilowatts total losses in the engine unit. Assuming that the producer is maintained ready for operation, there are four points to determine the curve or line of producer input. And the ratio between engine and plant output gives directly the gross efficiency of the gas-generating plant from coal pile to engine throttle. This curve shows that the producer maintains remarkably uniform efficiency throughout the range of plant load. This results from the fact that at zero output of station the producer is operating at over one-third its full-load rate.

A careful measure of oil consumption was made during the two weeks' run at full load, comprising 223 hours' operation; also the water consumption of the engine. During this period the average rate of cylinder-oil consumption was 0.09 gallon per hour, or, on the basis of a 10-hour working day, 4.9 gallons per week. This confirms to a considerable degree the experience at the Norton works, where an engine of the same size uses 3.5 to 4 gallons per week, 10-hour day—a rate so low as to have excited suspicion of its correctness. The high economy of oil is, however, due to the system of timed, forced circulation employed.

The average quantity of cooling water used was 6.56 gallons per boiler horsepower-hour, at heavy load with inlet temperature varying from 75 to 80° F. and an outlet from 140 to 150° F. This quantity is quite reasonable for the temperature rise. Inasmuch as a definite quantity of heat must be removed from the engine at a given load, the volume of water necessary evidently varies with the rise, so that in winter even less cooling water would be required. Economy of water may be carried to any reasonable point, provided the outlet temperature of any part does not exceed 150° F. The upper limit only is important.

Operating Results

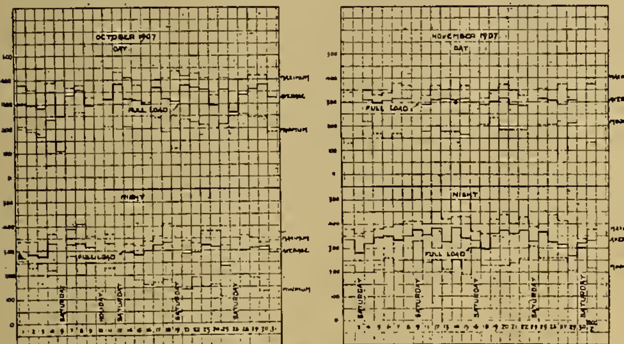
It seems to be the general impression that a gas power plant must be handled gingerly in order to obtain good results. The accompanying operating data from Richmond should dispel this impression. Fig. 2 shows typical results for two months' operation, representing, if anything, an output somewhat below normal. Fig. 3 is a typical hourly load record, showing overload capacity of plant. It is worth while to note the continuous operation throughout the week, 24 hours per day, and particularly the high average load sustained. The normal run at Richmond is six days without stopping. In fact, the producer fires remained undisturbed from July 4, 1907, until early in the present year, when an opportunity occurred to make careful inspection of the entire equipment.

The plant has sustained a load of 410 kilowatts for three hours, 19 per cent. overload on the engines, and even higher overloads for short periods. With rich gas, the power of the engine is correspondingly increased in a manner exactly analogous to the effect of variation in boiler pressure in a steam plant. How far this conservative practice may be carried depends upon the operator; it is for him to decide the limitations of his plant.

Operating Costs

From the preceding data and the other items of cost, the cost of power may be estimated at various load factors. Owing to the fact that the present power plant was made to accommodate a two-unit plant, the cost has been computed upon this basis; and in view of the excellent results that have been obtained, the electrical rating of the plant has been placed at 700 kilowatts, or 1,000 horsepower, at

[Continued on page 84]



TYPICAL MONTHLY LOG - 500 HP - 300 K W PRODUCER PLANT SHOWING AVERAGE, MAXIMUM AND MINIMUM LOADS RECORDED EACH DAY

FIG. 2. ELECTRICAL LOG FOR TWO MONTHS

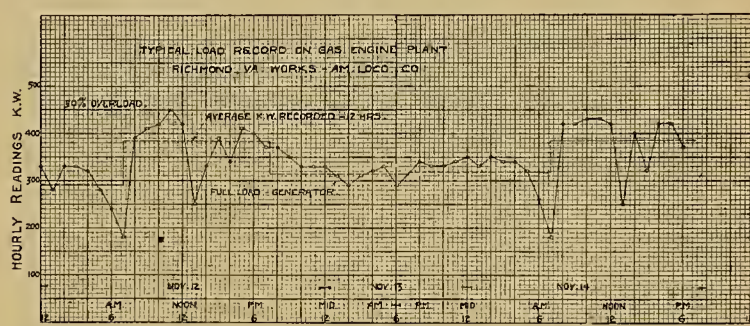


FIG. 3. TYPICAL HOURLY LOAD RECORD, SHOWING OVERLOAD CAPACITY

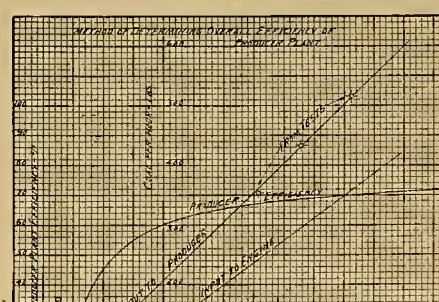


FIG. 4. GRAPHICAL METHOD OF DETERMINING OVER-ALL EFFICIENCY OF PRODUCER PLANT

1. Taking the mechanical equivalent of heat as 776 B. T. U., the thermal value of one horsepower is 2,545 B. T. U., or of a kilowatt, 3,412 B. T. U. Hence, absolute thermal efficiency equals 2,545 per B. T. U. per brake horsepower per hour, or upon an electrical basis, 3,412 per B. T. U. per kilowatt-hour.

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

ATTENTION IS DIRECTED to the announcement on another page of a new serial on "Alternating Currents and Their Applications" which is now in course of preparation and which will be begun soon in the Western Electrician. The serial articles which have appeared in this journal during the last few years have been helpful and popular. We feel confident that the one now announced will at least equal any of its predecessors in importance and timeliness. Mr. E. R. Wolcott, the author, late professor of physics and electrometallurgy in the Colorado School of Mines, is well fitted by education and actual experience for the congenial task which he has undertaken. Inspection of the earlier chapters shows that the new serial will possess a sincerity of purpose and a real usefulness which will make it a valuable addition to technical literature.

During the present activity in partisan politics much is heard of "keynotes." The keynote of the serial on "Alternating Currents" is "practical helpfulness." Neither too elementary nor too abstruse, simply practical, the work will be welcomed by a large proportion of the readers of the Western Electrician, we are sure, as an effective aid in the occupations in which they are engaged.

ST. LOUIS is to have its own Public Utilities Commission. There are to be five commissioners, to receive a salary of $2,500 a year each, and they shall determine, from time to time, by inspection of the books of the corporations affected, whether the rates charged for public service may not be reduced without confiscation of property. No provision is made, apparently, for raising rates if they are shown to be unprofitable, yet the rule should be made to work both ways, as it did in the La Crosse case in Wisconsin, where the state Railroad Commission had the honesty and courage to raise the rates for electric light and power when they were shown to be too low to be equitable or fair.

In the case of the St. Louis commission the salary would seem to be too low to attract men of the requisite character, ability and experience, unless, indeed, it is not expected that the commissioners shall give their entire attention to the work, which is perhaps the fact. Regulation of public-service corporations is inevitable if municipal ownership is not to prevail. Under a law which is honest and fair, and carried out by men who are honest and fair, it will be welcomed by the electric-light, electric-railway, telephone and other public-utility companies. But the regulation of rates should not be a matter of caprice or whim or politics or vengeance or favoritism. So far as possible it should be automatic; that is, carried out with reference to certain fixed principles which shall form an incentive to the company to reduce rates in its own interest—something after the order of the so-called London sliding scale.

In any event it is gratifying to observe that the tendency in St. Louis and elsewhere is not in the direction of municipal operation. Editorial comment on the report to the Civic League was made last week

MOISSAN of France is undoubtedly entitled to the credit of inventing the electric furnace as now known, which goes back to 1892. But it is interesting to observe that over half a century before that time an American scientist, Dr. Robert Hare of Philadelphia, invented what was substantially an electric furnace which was described in the Transactions of the American Philosophical Society of 1841. As noted by Dr. Charles A. Doremus in an interesting paper read before the recent Albany convention of the American Electrochemical Society, "Hare obtained, despite the disadvantages of a current from a primary battery, calcium carbide, phosphorus, graphite and metallic calcium, and there are just reasons, therefore, for regarding him as the earliest American scientific experimenter and discoverer in electrochemistry." This neglected experimenter called his batteries "deflagrators," and he used the principle of plunging the plates into the acid, or causing the acid to flow upon all the plates, simultaneously. He also, like Davy, used a large number of cells. Hare also invented, it seems, 30 years earlier, when but 20 years old, the oxyhydrogen blow-pipe. He does not appear to have obtained the recognition among American men of science which his work deserved.

STIMULATION of plant growth by electricity is a well recognized fact and has been the subject of experiments for 150 years. Nevertheless, the knowledge that the growth of plants may be accelerated under the influence of electricity has been turned to but little practical account. Within the last few years tests on a comparatively large scale have been carried out by Mr. J. E. Newman in England, and the results have been set forth in an interesting paper presented to the Naturalists' Society by Mr. J. H. Priestley. Mr. Newman used an overhead discharge system, and at Bevington Hall, in 1906, an area of some 20 acres was placed beneath the discharge field. Wheat was grown under the electrical discharge and compared with wheat grown under like conditions but without the electrical treatment. The difference was noticeable at an early stage. The straw in the electrified area was from four to eight inches higher, and the grain was ready for cutting three or four days before that in the adjoining field under ordinary conditions. The yield of the electrified wheat was from 29 to 39 per cent. greater per acre than that of the non-electrified. Moreover—and this is of especial interest—the electrified wheat sold at prices some 7½ per cent. higher, several millers in baking tests finding that it produced a better baking flour.

An article on the subject of "Electricity in Agriculture," based on Sir Oliver Lodge's report of these interesting experiments, is given elsewhere in this issue.

ALTHOUGH the number of recent accidents on the steam railroads of the country shows a decided decrease, the reports from electric railways, unfortunately, are not equally favorable of late. In fact, with the rapidly increasing traffic in the larger cities and the higher speeds and more frequent service being introduced on interurban lines, the number of electric-railway accidents seems rather to be increasing. The Public Service Commission of New York reports 218 persons killed and 1,210 seriously injured by all the traction lines in New York city during the first half of this year. While this is only a very small percentage of the millions of passengers carried by these lines, it is nevertheless an appalling number that must suffer from our advanced methods of conveyance. Urban accidents occur mostly to pedestrians struck by the front of the car and to passengers in getting on or off the car. The former should be protected by more effective fenders and wheel guards, and it is well that the Public Service Commission has undertaken extensive tests of such appliances. The "pay-as-you-enter" car is probably the most effective protection to passengers while entering and leaving the car, and its extended use will doubtless decrease these accidents as well as insure the collection of all the fares.

On interurban electric railways the conditions of steam-railroad practice are being adopted more and more. With them should go the adoption of block-signaling systems and reliable methods of dispatching as well as rigid training of the car crews strictly to observe signals and orders, because the worst accidents on these lines are almost always due to disobedience or carelessness of the operatives, resulting in disastrous collisions and wrecks. Managers of all electric railways can well afford to study the problem with earnestness and to adopt all precautions and appliances that insure safety of travel and thus still further advance the popularity of electric traction. A number of the transcontinental trunk lines are advertising the safety of their roads as an inducement for travel upon them. Why cannot electric railways say with equal force that their lines are protected from end to end with automatic devices that guard against the failure of the human machine as far as that is possible?

OPENING OF THE HARBOR AT GARY

The million-dollar harbor excavated out of the sand dunes at Gary, Ind., received its first shipment of ore on July 23d, when the great steel steamer Elbert H. Gary entered the electrically operated ore docks. The occasion was a gala day for the new steel town, and in addition to 11,000 tons of ore the vessel brought across the lake from the South Chicago slip of the Illinois Steel Company 350 members of various Chicago and Gary business associations. The trip consumed several hours, and the Gary was convoyed by the revenue cutter Tuscarora, the gunboat Wolverine, the training ship Dorothea and the lighthouse steamer Sumas.

As the Gary entered the docks to the sound of the blowing of every whistle within earshot the government vessels, remaining outside, fired a salute of 21 guns. Following speeches from the Gary's bridge by Mr. John W. Kern of Indianapolis, Democratic candidate for the vice-presidency, Congressmen Crumpacker and Mann and other notables, one of the great steel grab-buckets, operated electrically, was lowered into the ship's hold and at a single filling 10 tons of ore was raised aloft and rotated that all might see. The operation was performed with the ease with which one might lift a spoonful of sugar, and the load was quickly deposited in one of the immense concrete storage pits. The passengers on the boat were joined by members of the local construction force and a hurried inspection of the big plant made.

The mills at Gary on which the steel company has expended $30,000,000 represent the most modern engineering in construction and operation. Electricity will serve many important purposes here. The grabs and bridges for unloading and conveying ore to the blast furnaces are all electrically operated. Some of the largest induction motors ever built will supplant the usual blooming mill engines in driving the rolls. Hoists, cranes and all possible steel-handling machinery are electrically driven.

The power plant will contain 25 4,000-horsepower gas engines, utilizing waste gases from the furnaces. Fifteen of these units will be direct-connected to 25-cycle three-phase generators for supplying distant parts of the plant, two will drive direct-current machines to operate motors near the power house, and eight will be used for blowing engines. The total electrical horsepower of this power plant will be more than double that of any other gas-engine driven installation in the world.

At the present time the ore-handling apparatus and many of the buildings are entirely completed, but the furnaces and rolls are only partially installed. The machine and electrical shops are in partial use in the work of construction.

Where two years ago the site of Gary was a sandy beach, there is now a modern city made to order with broad, paved streets and sidewalks, and substantial buildings. The site of the town was selected as the ideal point for a great steel manufacturing center, since the ore can be brought to it down the lakes, meeting the coke and limestone from the fields of Indiana and Illinois.

While work is going on rapidly in the completing of construction, the lighting of the first furnace fires at Gary, another event to which ceremony is to be attached, may be a matter of some time, as the present conditions of business are explained not to require the starting of the new mills.

INCREASE IN VALUE OF ELECTRIC STOCKS

Since the acute business depression of last fall there has been a gradual rise in the price of railroad, industrial and copper-mining stocks, including the shares of the electrical manufacturing and operating companies which are listed on the Stock Exchange. A decided impetus to the general upward movement was given by the decision of the United States Court of Appeals at Chicago last week, reversing Judge Landis' decision in fining the Standard Oil Company $29,240,000. There was a sharp advance, and the highest range of prices since last October was attained. General Electric, for instance, reached 148½, a rise of 59 points since last fall. Westinghouse manifested an almost equally large increase, mounting from 32 to 89¼—a gain of 57¼. Similarly, Allis-Chalmers preferred rose 21¾ points; American Telephone and Telegraph, 32 points; Consolidated Gas, 67¼; Commonwealth Edison, 20; Mackay Companies, 27½, and so on. This increase is found in every case, of course, by comparing the lowest price during the depression last fall with the high prices of last week. Early this week there was some recession from the top-notch quotations of last week, but in most cases only a point or two.

MICA

The total value of the mica produced in the United States in 1907 was $392,111. This production came from 11 states—North Carolina, South Dakota, Alabama, South Carolina, Colorado, New Hampshire, Idaho, Georgia, Virginia, New Mexico and Maine—named in order of the value of their output. North Carolina produced more than half of the total. The total production is the largest on record. The imports in 1907 were valued at $925,259.

The large and increasing consumption of mica is due to its greater use in electrical work. For insulating purposes it has no superior, its perfect cleavage, its flexibility, elasticity, infusibility, toughness and softness, combined with its high non-conductivity to electricity, making the sheets especially serviceable for many forms of insulating material.

Two varieties of mica—muscovite and phlogopite—are in common use. Both are satisfactory for making mica board or "micanite," as it is called, which is prepared by splitting the mica into thin sheets, systematically placing them together with shellac, and then subjecting the whole to pressure. In this way large composite sheets are made, which are as suitable as single sheets of mica for most insulating purposes. "Micanite" can be bent, rolled into tubes, or cut, and, of course, can be obtained in very large sheets.

Scrap mica is ground and used for decorative purposes in brocade paints of silver, gold and bronze colors, and for wall papers. It is especially suitable for the manufacture of lubricants, and when mixed with shellac is serviceable in making many molded forms for electrical insulation, such as handles and wire insulators.

Muscovite, the white mica of commerce, is obtained only from pegmatite, a very coarse-textured rock, whose composition is nearly that of granite, into which it may grade.

Commercially valuable deposits of phlogopite have not yet been found in the United States.

A report on the production of mica in 1907, by D. B. Sterrett, has just been published by the United States Geological Survey, and may be had on application to the director of the Survey at Washington, D. C.

NEW SERIAL ON ALTERNATING CURRENTS

The Western Electrician takes pleasure in announcing that it is planning to begin the publication, early in the fall, of a new serial bearing the title "Alternating Currents and Their Applications." There is a constant demand from working electrical men and students for helpful information on the principles and uses of alternating currents, and this demand will be met in the exposition of the subject now in preparation. The plan is to make the series of especial value to plain, practical men of average intelligence. Some general knowledge of electrical principles on the part of the reader will be supposed; but nevertheless care will be taken to establish elementary principles fully and clearly, and only simple mathematics will be used, and that as sparingly as possible. Pains will be taken to avoid abstruse demonstrations and complex mathematical reasoning; everything will be set forth in language which should be understood by every reader of the Western Electrician making an honest effort to increase his store of knowledge by studying the articles of this series.

The author of this serial is Mr. E. R. Wolcott, formerly professor of physics and electro-metallurgy in the Colorado School of Mines, but now engaged in practical work in Chicago. Mr. Wolcott is well fitted for his task, not only as the result of his experience as a teacher but also from actual work in the electrical field since his graduation from the electrical engineering course of the University of Wisconsin ten years ago. It is needless to say that he is in entire sympathy with the idea of setting forth the principles of alternating-current work in a manner which shall be a golden mean between the words-of-one-syllable effusions for the kindergarten class on the one hand and the involved, highly technical and mathematical treatment, of use only to a few trained specialists, on the other.

Diagrams and other illustrations will be freely used as needed to elucidate the text.

The subject-outline of the series (subject to some minor changes) is as follows:

I. *General Principles.*
  1. Introduction.
  2. Generation.
  3. Use of Instruments.
  4. Transmission.
  5. Induction.
  6. Transformers.
  7. Eddy Currents.
  8. Graphical Representation.
  9. Polyphase Currents.
  10. Capacity.

II. *Generators.*
  1. General.
  2. Rotating Armature.
  3. Rotating Field.
  4. Polyphase Generators.
  5. Parallel Operation.

III. *Motors.*
  1. General.
  2. Synchronous.
  3. Induction.
  4. Repulsion.
  5. Single-phase Series.

IV. *Transformers.*

V. *Rotary Converters and Motor-generators.*

VI. *Lighting.*
  1. Arc Lamps.
  2. Incandescent Lamps, including Metallic Filaments.
  3. Mercury-vapor, Nernst and Others.

VII. *Thermal Applications.*

VIII. *Transmission and Sub-stations.*

IX. *Switchboards and Regulation.*
  1. Indicating and Recording Instruments.
  2. Lightning Protection, Ground Detectors, etc.
  3. Switches and Automatic Cut-outs.
  4. Controlling Devices.

X. *Summary.*

PUBLIC UTILITIES COMMISSION FOR ST. LOUIS

St. Louis is to have a Public Utilities Commission. The City Council has passed the measure creating a board of five members, and the bill is expected to become a law within a week. The measure met some opposition in the Council, but was finally passed, as had been expected.

The bill provides that the Council shall appoint three and the House of Delegates two members of a commission, each to receive a salary of $2,500 a year and all necessary expenses incurred in the work. The members of the commission shall be appointed within 60 days after the approval of the ordinance by the mayor, which will make the maximum time before a commission is created about the middle of October. The commission will be permanent.

The commission's work will consist of an inspection of all books of the several public-service corporations, with a view to determining whether a decrease in rates charged the public for service could be made without confiscation of corporation property. Reports are to be made by the commission every six months, as often as one class of corporations have been investigated or at any time either house of the Municipal Assembly shall request it to do so.

Speculation as to the probable members of the commission is already busy around the City Hall. The Council appointees must be approved by the House, and vice versa. Thomas B. Carter, former supervisor of city lighting, has been regarded as likely to be one of the House nominees. Other names mentioned are those of Judge Hiram N. Moore and Lawrence P. Daley.

PUBLIC LIGHTING FAILURES

"Experience teaches us that so far cities have not often proved an unqualified success as operators of utility plants of this character (electric-light and power), for the actual cost of operation is usually much higher under municipal than under private management."

This is the statement made in the signed opinion of Wisconsin's railroad commissioners, B. H. Meyer, Halford Erickson and John H. Roemer. The opinion was given out in connection with the recent case of the city of Dodgeville against the Dodgeville Electric Light and Power Company. The complaint stated that the charges were high and that the service was poor. The case was dismissed, the commissioners finding that the property was not a paying enterprise, and declined to order reductions or improvements.

INTERNATIONAL CONGRESS ON ELECTRICAL UNITS AND STANDARDS

Announcement was made in the Western Electrician of June 6th of the appointment by the Board of Trade of Great Britain of a committee to make all the preparations and draw up a programme for an International Congress on Electrical Units and Standards. This committee has chosen October 12th as the day on which the Congress is to convene in London. It has also prepared the following announcement as to the proposals that will be laid before the Congress for consideration:

The general object of the International Congress on Electrical Units and Standards, which is to meet on the invitation of his majesty's government in London in October, 1908, is to consider and advise as to the steps which should be taken to bring about agreement in the definition of electrical units which form the basis of legislation in different countries, and in the methods of constructing and employing the electrical standards necessary to give effect to these definitions.

It is hoped that the delegates to the Congress may find themselves able to embody their conclusions in draft articles which might be recommended to the several governments represented as a basis for uniform legislation and administration in relation to electrical units and standards.

The fundamental units of electrical measurement are the ohm, the ampere and the volt. Of these two are primary units, being independent, and the other secondary or derived. It is generally agreed that the ohm should be accepted as one of the primary units. There is some difference of opinion as to whether the ampere or volt should be the second. This point will be one for the conference to consider.

Again, the ohm is realized by means of the resistance of a column of mercury of definite dimensions, the ampere by means of the electrolytic deposition of silver, and the volt by aid of a standard cell.

If this method of realizing the units be accepted by the Congress, specifications for the ohm and ampere will call for consideration, while the standard cell must be selected and the method of setting it up prescribed.

In view of the scientific questions raised in connection with each of these matters, including also the choice of the two primary units, it will be suggested at an early meeting of the Congress, should such a course appear to be desirable, that the Congress should appoint a small technical commission of experts to discuss the question, and report thereon to the Congress.

The Congress will also be asked to consider the best methods of securing uniformity of administration in the future, and for arriving at a decision on any questions left undecided at the close of the Congress.

It is desirable to have some definite questions before the Congress, and with this object the following propositions embodying conclusions arrived at by the representatives of the various national standardizing laboratories which met at the Reichsanstalt in 1906, and which are also generally in accordance with the decisions of the Chicago Congress held in 1893, will be brought forward as a basis for discussion.

1. That the ohm shall be the first primary unit.
2. That the ampere shall be the second primary unit.
3. That in consequence the volt shall be treated as a secondary or derived unit.
4. That the international ohm be defined as the resistance at the temperature of melting ice of a column of mercury of uniform cross-section terminated by planes at right angles to its length 106.3 centimeters in length and 14.4521 grammes in mass.
5. That the international ampere be defined as the unvarying electrical current which, when passed through a solution of nitrate of silver in water, deposits silver at the rate of 0.001118 gramme per second.
6. That the international volt be defined as that electromotive force which, when applied steadily between the ends of a conductor of resistance one international ohm produces a current of one international ampere.
7. That the Weston cadmium cell be adopted as a convenient standard of electromotive force, having at a temperature of 17° C. an electromotive force of —— international volts, but that it is undesirable that the number representing the electromotive force of this cell should be the subject of legislation in any country.
8. That specifications dealing with the methods of setting up mercury standards of resistance, of realizing the ampere by the deposition of silver and of preparing standard cells, be issued with the authority of the Congress, and that for this purpose a technical commission be appointed to prepare these specifications.
9. That the Congress consider and advise as to the best method of securing uniformity with regard to the fundamental electrical standards for the future.

ILLUMINATING ENGINEERS' CONVENTION

A preliminary programme has been prepared by the committee of the Illuminating Engineering Society that is arranging for the second annual convention of the society to be held in Philadelphia on October 5th and 6th. The headquarters and meetings will be in the Hotel Walton. The week of October 5th will be a festive one, as Philadelphia will celebrate the two-hundred-and-twenty-fifth anniversary of its founding. Entertainment features for the convention guests are being arranged in connection therewith.

All members who indicate their positive intention of attending the convention will be supplied with advance copies of the papers. These will be read only in abstract or by title, so as to leave almost the entire time of the convention meetings for discussion. The programme of papers to be presented is as follows:

President's Address—Dr. Louis Bell, Boston.

Architecture and Illumination—Emil G. Perrot, Philadelphia.

Modern Gas-lighting Conveniences—T. J. Little, Jr., Philadelphia.

Railway Car Lighting—H. M. Davies, Philadelphia.

Relation between Candlepower, Voltage and Watts of Different Types of Incandescent Lamps—Dr. F. E. Cady, Washington, D. C.

Illuminating Value of Petroleum Oil—Dr. A. H. Elliott, New York.

Structural Difficulties in Installation Work—J. R. Strong, New York.

Street-lighting Fixtures, Gas and Electric—H. Thurston Owens, New York.

Oil Burners—W. T. Sterling, New York.

Design of the Illumination of the New York City Carnegie Libraries—L. B. Marks, New York.

Intensity of Natural Illumination Throughout the Day—L. J. Lewinson, New York.

Calculation of Illumination by Flux-of-light Method—J. R. Cravath, Chicago, and V. R. Lansingh, New York.

Specific Intensity of Lighting Sources—J. E. Woodwell, Washington.

Design of Reflectors for Uniform Illumination—A. A. Wohlauer, New York.

The Ives Colorimeter in Illuminating Engineering—Dr. H. E. Ives, Washington.

International Unit of Light—Dr. E. P. Hyde, Washington.

Some Experiments on Reflections from Walls, Ceiling and Floors—V. R. Lansingh and T. W. Rolph, New York.

GOVERNMENT ENGINEERING INSPECTOR WANTED

The United States Civil Service Commission announces an examination on September 2d and 3d, at the usual cities, to secure eligibles from which to fill a vacancy in the position of inspector of mechanical and electrical engineering (male), at $2,190 per annum, in the office of the supervising architect, Treasury Department, and similar vacancies as they may occur.

The examination will be weighted as follows: Mathematics (up to and including trigonometry), 10; practical engineering questions, 40; drawing and design, 20; training and experience, 30.

The duties of the position consist of inspecting and testing the mechanical and electrical equipments entering into the modern government or office building, requiring high-class education and extensive experience in all branches of engineering, embracing this class of work. Applicants should apply to the Civil Service Commission at Washington for application form 1312. The application must be filed with the commission before August 22d.

CONTROLLER PATENT UPHELD

In handing down his opinion in the case of the Westinghouse Electric and Manufacturing Company, complainant, against the Electric Controller and Supply Company of Cleveland, Ohio, for alleged infringement of United States patent 518,693, relating to controllers for street-railway motors, and assigned to the Westinghouse company by the inventors, Philip Lange and Benjamin G. Lamme, Judge R. W. Tayler of the Northern Ohio United States Circuit Court decides that the contested patent was valid and the infringement was committed. The defense denied both validity and infringement and alleged anticipation by prior patents and prior use of a similar device. There was testimony to the effect that in consequence of the invention methods of controller construction were changed, the new device displaced others and 140,000 were manufactured and put into use. The complaint of infringement was sustained.

PROGRAMME FOR OHIO MEETING

As previously announced, the fourteenth annual convention of the Ohio Electric Light Association will be held at Hotel Victory, Put-in-Bay Island, on August 25th, 26th and 27th. Arrangements for the meeting are being rapidly completed, and the indications are that last year's convention, which was a very successful one, will be far surpassed by this convention. All the meetings will be held in the convention hall of the Hotel Victory. Each of the papers presented will be followed by a discussion. The programme is as follows:

Tuesday, August 25th

Preliminary Meeting at 10 a. m.

Meeting of all committees for organization and work.

First Regular Session 1:30 p. m.

President's address.

Announcements.

"Gas Engines in Central-station Work"—William M. Adams, Citizens' Gas and Electric Company, Elyria, Ohio.

"Report on Gas-producer and Oil-engine Plants," by B. H. Smith, Lexington Electric Plant, Lexington, Ohio, and B. H. Gardner, Dayton Lighting Company, Dayton, Ohio.

Question Box.

Entertainment for Tuesday.

For the Ladies—Afternoon. Card party.

For All—4 p. m. Bathing beach. Evening. Ball, reception, singing.

Wednesday, August 26th

Morning Session at 9 o'clock.

Appointment of committees.

"How Can We Best Increase Our Business?"—F. H. Plaice, Hastings, Mich.

"Best Ways and Means of Getting Out and Keeping Out Private Plants in Central-station Territory"—B. H. Gardner, Dayton Lighting Company, Dayton, Ohio.

"Electric Signs, Outlining and Other Special Uses of Electricity as an Adjunct to Profitable Central-station Work," by J. C. Rothery, East Liverpool Traction and Light Company, East Liverpool, Ohio; C. A. Elliott, the Dayton Lighting Company, Dayton, Ohio, and H. Engel, Youngstown Consolidated Gas and Electric Company, Youngstown, Ohio.

Question Box.

Recess at 12:30 p. m.

Serving of light luncheon in Convention Hall, programme to be taken up immediately after.

"Should Central Stations Do Wiring?" by Edward F. Gwynn, Delaware Electric Light and Power Company, Delaware, Ohio; and C. C. Custer, Miami Light, Heat and Power Company, Piqua, Ohio.

"Illuminating Engineering."—J. S. Codman, Boston, Mass.

Report on Experience of Central Stations with Tungsten Lamps—General Discussion.

Question Box.

Entertainment for Wednesday.

For the Ladies—10 a. m. Visit to the caves and other points of interest. 12:30 p. m. Special luncheon in the main dining room.

For All—3 p. m. Bathing beach. Evening. medley of fun—bridge whist, music, impromptu vaudeville.

Thursday, August 27th

Morning Session at 9 o'clock.

Reports of committees.

Election of officers.

"Some of the Causes of Failure in Municipal Lighting Stations"—D. L. Gaskill, Greenville Electric Light and Power Company, Greenville, Ohio.

"Grounding Alternating-current Secondaries"—L. Clifford Anderson, Franklin Electric Light Company, Franklin, Ohio.

Question Box.

Afternoon Session at 2 o'clock.

"Gas and Gasoline Competition, and Best Ways to Meet It"—Fred Leslie, Muncie Electric Light Company, Muncie, Ind.

"Experience with Luminous Arc Lamps"—C. H. McKay, Toledo Railway and Light Company, Toledo, Ohio.

Question Box.

Entertainment for Thursday.

For Ladies—Morning. Band concert. Afternoon. Euchre party, bowling.

For All—Evening. Grand banquet, as the guests of the association, with electric vaudeville between courses.

QUESTIONS AND ANSWERS

HIGH-FREQUENCY SURGES

F. T. E., Chicago: What produces the extremely high frequency on a transmission line when there is a ground on the line?

ANSWER

If a breakdown in the insulation of a transmission system occurs which results in a spark or arc through the insulation to ground, this arc, by establishing a path to ground, quickly discharges the cable or conductor, the charge of the cable passing over the arc to ground. As soon as the cable or conductor is discharged and at the same potential as the ground, the arc ceases because there is no voltage left to maintain it; therefore, the arcing path to ground is broken and the conductor thus disconnected from ground. The conductor is then charged again to its normal potential and during the inrush of the charge the potential is momentarily built up to double voltage. This causes a spark or arc to pass again between the conductor and ground which discharges the conductor again and then opens once more, continuing in this way with a series of successive sparks that discharge the conductor by currents rising momentarily to high values.

These discharge currents follow each other with the rapidity of charge and discharge of the cable or conductor, which is many thousands per second. Each spark discharge sends out an impulse or traveling wave called a recurrent surge. This explanation of such surges is in accord with that given by Dr. C. P. Steinmetz.

NON-CONDUCTING WIRE

E. A. C., Keswick, Iowa: Your answer to my query last week in regard to a telephone wire that would not conduct current assumes that the wire was insulated. The wire was not insulated. Had it been merely a case of the wire being broken inside the insulation, the trouble would have been easily found, as I have found many such cases.

ANSWER

As the cases where an unbroken bare wire that is properly installed but will not conduct current are extremely rare, it was naturally assumed that the wire was insulated. By the addition of the single word "bare" in describing the wire, the inquirer could have avoided this error.

If the connections at the terminals of the wire were clean and made tight any bare wire that was otherwise intact must conduct current without difficulty. If no current could be perceptibly transmitted over the wire, the connections may have been poorly made; possibly there was a crack or flaw in the wire, not readily discernible, but still offering sufficient resistance to render what feeble current that did pass too weak to affect the current-detecting means. In the absence of more explicit information on what the conditions were, no more definite explanation can be given.

CHANGE OF FREQUENCY WITH INDUCTION MOTOR

D. C. M., Victor, Colo.: Is it possible to operate a 60-cycle three-phase induction motor of the squirrel-cage type on a 30-cycle circuit? The number of poles is to be changed to one-half, so that the motor will have the same relative speed. Would the decreased reactance cause excessive heating?

ANSWER

A reduction in the frequency such as that proposed, will reduce the reactance and impedance of the motor so much that the increased current would doubtless cause dangerous heating. If the voltage applied to the motor could be reduced at least 25 to 30 per cent. this trouble would not be so serious, since the motor could also not be loaded to the same extent. It would, however, be running at a much lower efficiency and, unless it was a temporary situation, is not to be recommended for satisfactory service.

Plans are being formulated for an electric line from Keystone, Wyo., a mining camp in the Snowy range, to a point about nine miles away, on the Walden extension of the Laramie Plains line, power to be obtained from Douglas Creek and the Platte River. The camp is one of the most important in that range.

ELECTRICITY IN AGRICULTURE

[From the London correspondent of the Western Electrician.]

Sir Oliver Lodge, F. R. S., has published the results of some experiments which have been carried out on a somewhat large scale at a farm near Evesham, Gloucestershire, on the effects of electricity upon agriculture. These experiments have been so successful that the experimental apparatus has been replaced by a permanent installation, and other installations are in course of erection. The experiments, which are here described, have been actually carried out by Mr. J. E. Newman of Gloucester, acting in conjunction with Mr. R. Bomford of Salford Priors, who determined to carry them out on a really large scale, after many preliminary experiments based upon the work of Lemström. These gentlemen went to Sir Oliver Lodge to see if he could help them electrically, and enable them to maintain a continuous high-tension discharge for hours together each day over 10 or 11 acres by means of power furnished by an oil engine and dynamo.

The method which has been adopted is to stretch over the field to be treated a number of wires on poles, something like low telegraph wires, but high enough for loaded wagons and all the usual farming operations to go on underneath the wires without let or hindrance. The wires are quite thin, and are supported by a few posts in long parallel spans, about 30 feet apart. They are supported on the posts by elaborate high-tension insulators, and they extend over all the acreage under experiment, a control plot of similar land, under similar conditions being, of course, left without any wires.

The system of conductors is then connected at one post with a generator supplying positive electricity at a potential of something like 100,000 volts, and with sufficient power to maintain a constant supply of electricity at this potential. Leakage immediately begins, and the charge "fizzes" off from the wires with a glow which is visible in the dark and with characteristic sound. A person walking about below the wires can sometimes feel the effect on the hair of the head.

Electrification is maintained for some hours each day, but is shut off at night; it is probably only necessary to supply it during the early morning hours in the summer time, and in spring time or in cold, cloudy weather for the whole day, or during the time of the plants' greatest activity. But at what stages of the growth of a plant the stimulus is most effective has still to be made out.

The power required to generate electricity is very small, for although the potential is high, the quantity is insignificant, and the energy is accordingly comparatively trivial.

The power is generated by a two-horsepower oil engine driving a small dynamo in an outhouse of the farm. Thence the current is taken by ordinary overhead wires to the field, where it enters a suitable weathertight shed, which contains the transforming and rectifying apparatus. The only moving part here is the "break," and if the original dynamo had been an alternator, even this might have been dispensed with. The transformer is a large induction coil, specially made to stand continuous use, and its current is then rectified by a patented device of Sir Oliver.

The negative electricity is conveyed direct to earth, while high-tension electricity, all of positive sign, is led by a specially insulated conductor out of the shed to the nearest pole of the overhead insulated wires, which are thereby maintained at continuous high positive potential.

The overhead system of wires covers about 19½ acres of ground. The wires were mounted on insulators placed upon larch poles some 15 feet high, which were placed in rows, the rows being separated by a distance of 102 yards, the poles in a row being 71 yards apart. Stout telegraph wire carried the current down each row, while thin galvanized-iron wires placed some 12 yards apart were stretched between the rows and acted as discharge wires. In this way 22 poles were sufficient to support the wire over 19 acres. Roughly, only one pole per acre is required; therefore, the inconvenience is practically nil. The height at which the wires are taken allows a loaded wagon to go beneath. Owing to the flexible suspension, risk of breakage to the wires is very small. During the two years the wires have been up at Bevington, apart from a few wires breaking at harvest time by catching in top of extra high wagon loads, only one wire has fallen.

Among the results of the experiments in 1906 and 1907 it was found that Canadian Red Fife wheat gave 35½ bushels an acre in the electrified ground and only 25½ bushels in the unelectrified portion; similarly, English White Queen wheat produced 40 bushels to the acre in the electrified ground against 31 bushels in the unelectrified ground. Moreover, the electrified wheat sold at prices some 7½ per cent. higher, several millers in baking tests finding that it produced a better baking flour. No theoretical conclusions can be drawn from this fact, owing to the uncertainty existing as to what factors determine the strength of wheat, but it is interesting to note that greater strength is usually accompanied by increase in percentage of total nitrogen. Later researches indicate that it is a function of the sugar present. The somewhat poor yield of wheat obtained from the unelectrified portion of the field is probably explained by a deficiency in lime, which has now been rectified. Further, the wheat was spring sown and Red Fife under this condition does not usually yield good crops. The experiments are being repeated upon wheat during the present season, and strawberries are also under treatment once more.

In 1907 wheat was again grown in the 1906 wheat field. Current was cut off from most of the barley fields, the land being sown with clover and rye grass. In an adjoining field 8½ acres was planted with strawberries (Stirling Castle) in March, approximately 2¾ acres having a wire netting put over them. Mangel-wurzels were planted between the strawberry rows.

The wheat field was, during the early spring, given a dressing of lime, 1,120 pounds to the acre, with 448 pounds to the acre of bone meal drilled in. The unelectrified part was given 168 pounds of sulphate of ammonia and the electrified part 84 pounds. Barley was grown on the strawberry field in 1906, and this was given 10 tons per acre of farmyard manure, which was plowed in.

Among the results of crops during 1907 were 41.4 bushels of wheat to the acre for the electrified and 32 bushels to the acre for the unelectrified ground, an increase of 29 per cent. in favor of the former.

The strawberry crop, being the first year, was very small, but the result showed a 35 per cent. increase, while earlier ripening was also observed.

Analysis of mangel-wurzel crop showed an increase in the sugar of the beets where electrified.

Raspberry canes showed a marked improvement in growth, and small plots of tomatoes also showed large increase in the crop. A curious point about the raspberries was that the foliage and fruit on the old canes showed no difference, but the new growth, particularly after the old wood was cut back, showed an enormous difference in favor of the electrified.

A GREAT POWER-TRANSMISSION SYSTEM

N. W. Halsey & Co. give the following information regarding the Pacific Gas and Electric Corporation and constituent companies: "The California Gas and Electric Corporation is that part of the system which furnishes gas, electric lighting and power to practically all of Central California outside of San Francisco. A large amount of power is also supplied to the latter city. The territory served covers an area of about 32,000 square miles, or over four times the area of the entire state of New Jersey. There are 11 hydraulic generating stations, together with a number of auxiliary steam and gas generating stations, the total generating capacity being 137,928 horsepower. Seventy-four high-voltage transmission lines traverse the territory in all directions, the aggregate length being about 1,500 miles, or half the distance from San Francisco to New York.

"The San Francisco Gas and Electric Company distributes gas and electricity in the city of San Francisco. This property has now been restored to the state of efficiency existing before the San Francisco fire. The amount of gas now being sold is actually greater than in 1905, and the volume of electric current sold is much larger."

The new Salt Lake and Ogden interurban was to be ready for traffic by August 1st, as announced by the president of the company.

TEST OF GAS-ELECTRIC PLANT

[*Continued from page 79.*]

which rating the investment cost becomes about $138 per kilowatt, or $96 per boiler horsepower complete, including machinery, buildings, foundation,

TABLE II.—COST OF POWER, 700-KILOWATT GAS POWER PLANT.—ASSUMPTIONS.

Equipment cost:
Building and machinery........................$96,600
Cost per kilowatt, $138; per boiler hp., $96.60.

Fixed charges:
Interest 5 per cent., taxes and insurance 1.5 per cent., depreciation (sinking fund 15 years 5 per cent.), 4.63 per cent., running repairs 1.5 per cent. on investment. Total 12.63 per cent. per year.. 12,220

Operation:
300 days, 7,200 hours per year, 5,040,000 kw.-hr.
Input to auxiliaries, 5.4 per cent. full, 10.8 per cent. half-load.
Standby losses, producer plant, 1,600 pounds per week, 2.1 per cent. full, 3.1 per cent half-load.
Fuel rate, full load, 1.59 pounds + 2.1 per cent. = 1.62 pounds per kilowatt-hour; half-load 2.1 pounds + 3.1 per cent. = 2.17 pounds per kilowatt-hour.

COST OF POWER, 700-KILOWATT TURBINE PLANT.—ASSUMPTIONS.

Equipment:
Building and machiery, $100 per kilowatt......... $70,000

Fixed charges:
Interest 5 per cent., taxes and insurance 1.5 per cent.; depreciation (sinking fund 16⅔ years at 5 per cent.) 4 per cent.; repairs 1 per cent.; total 11.5 per cent.......................... 8,050

Operation:
300-day year, 7,200 hours.
Average water rate, full-load 21.5 pounds per kilowatt-hour.
Average water rate, half-load 25.5 pounds per kilowatt-hour.
Gross evaporation, 7.5 to 8.0 pounds.
Standby, banking, 10 to 15 per cent.
Gross coal consumption, full, 2.96 pounds per kilowatt-hour; half, 3.9 pounds per kilowatt-hour.

Wages and supplies—Same as gas.

piping, erection—in fact, all items except the value of the land occupied. Considering the limited size of the plant, this does not represent an excessive cost, which in large plants would probably be as low as $100 to $125 per kilowatt.

In this total cost of power are included the usual fixed charges—interest at five per cent., taxes and insurance, 1.5 per cent. In the absence of any data on repairs (there having been none on the engine up to the present time, and very small repairs on generator and producer), this item has for convenience been included in the fixed charges at 1.5 per cent. on the plant investment. Further, depreciation has been included in the form of a sinking

TABLE III.—COST PER KILOWATT-HOUR AND HORSE-POWER-YEAR, GAS PLANT.

Cost Items.		Full load	Half load
		Cents per kw.-hr.	
Coal	at $1.00	0.081	0.109
	2.00	0.162	0.217
	4.00	0.324	0.434
	6.00	0.486	0.651
Wages	per year, $6,160	0.121	0.242
Supplies............	" 3,850	0.076	0.143
Fixed charges........	" 12,200	0.242	0.484
Total costs—coal at	$1.00..............	0.520	0.978
	2.00..............	0.601	1.086
Richmond coal	...2.70..............	0.658	1.163
	4.00..............	0.763	1.303
	6.00..............	0.925	1.520
		Dollars per electric hp.-year	
Equivalent power rate:			
300-day year, coal at	$1.00..............	$27.90	$52.40
	2.00..............	32.30	58.20
	2.70..............	35.60	62.40
	4.00..............	41.00	69.90
	6.00..............	49.60	81.50
Charges for auxiliaries if motor-driven		2.7 p. c.	7.4 p.c.
Saving, gas over steam:			
Coal at	.....$1.00	—3 per cent. loss	—8.5 per cent. loss
	2.00	+8 per cent. gain	+0.9 per cent. gain
	2.70	12.9 per cent. gain	4.7 per cent. gain
	4.00	19.6 per cent. gain	12.4 per cent. gain
	6.00	33.7 per cent. gain	19.0 per cent. gain

fund, based upon 15 years' life of plant at five per cent. interest. This latter method may be contrary to general practice, but considering the nature of the depreciation fund and its earning capacity, the annuity method seems most logical.

These costs are shown in Table II. Based on 300-day operation, 7,200 hours per year, the fixed costs are distributed only over the operating period, not over the entire year. And, assuming the price of coal largely determined by location, the efficiencies at various loads are considered constant, irrespective of the price of coal. Both standby losses and power-consumption charges have been included. As we are considering an industrial plant in which the load averages practically uniform throughout the day, it suffices to estimate power costs at full and half loads, respectively. This has been done in Table III. for various coal prices. Coal prices are based upon net ton.

The results show that at the price of fuel at Richmond, $2.70, power can be delivered at switchboard at a cost of two-thirds of a cent per kilowatt-hour for a fully loaded plant operating 7,200 hours per year, or less than 1.25 cents operating at half-load, and this taking into account fixed charges which range around 40 per cent. of the total cost. Even with coal as high as $6 per ton, the total cost of power would be under one cent per kilowatt-hour, obviously an excellent result.

RELATIVE COST OF GAS AND STEAM POWER.

That there may be no misunderstanding of the preceding cost results, a comparison has been drawn up for a steam-turbine plant operating under the same load. This comparison covers only two variable factors, coal cost and loading. And, while not intended to be of more than tentative interest, it will serve to show the general range of working in which the gas and the turbine plant will respectively predominate. The assumptions upon which this comparison is based are given in Table II.; the costs are embodied in Fig. 5, and the relative saving in Table III.

At the price of coal prevailing in Richmond, the gas plant shows 13 per cent. gain over steam at full load, and five per cent. at half-load. Owing to the handicap of higher fixed charges, the turbine plant naturally shows a lower power cost with low-priced coal; that is, where freight rates are low. But even a mine operator is not justified in charging himself for power fuel less than the prevailing market price (f. o. b. mines). For the high-grade fuels, the mine rates are about $1.25 for

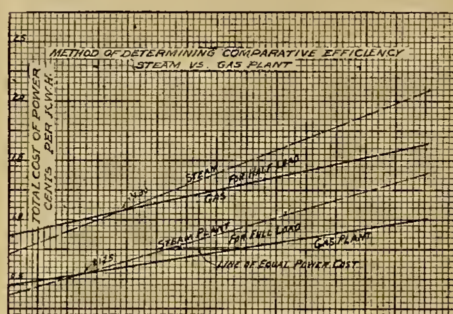


FIG. 5. GRAPHICAL METHOD OF DETERMINING COMPARATIVE COST EFFICIENCY

run-of-mine and $0.90 for slack and screenings. Hence, in reality, this gas power system influences an extensive field. It is evident from the diagram that a less efficient prime mover than the steam turbine would show a cost line lying not only above but at a greater inclination than the turbine line, which would bring the point of equal cost between gas and steam to a still lower price of coal, and largely increase the saving. In Fig. 5 the crossing of the steam and gas lines indicates the starting point of gas power work—$1.25 coal for a fully loaded plant, and $1.90 at half-load. Or, considering the matter in another light, with steam coal at $2.70, we could afford to pay about $4 for gas coal for the same cost of power.

On the other hand, with light loads or fluctuating loads averaging but a fraction of the generating capacity, the gas plant is evidently at a disadvantage. And for this reason the turbine plant still finds exclusive application in all service subject to extreme overloads of variations. In fact, with the extension of a large electric power system, such as at the Richmond works, it is possible that a combined gas-engine-turbine plant may best meet load requirements with the highest resultant economy, the turbine unit carrying fluctuating peaks and the gas engines the uniform load, as suggested by Mr. H. G. Stott. At present, hot gas-engine-jacket water is utilized directly for boiler feed in an auxiliary air-compressing plant, although charged for in the cost table. This arrangement would, of course, be even more applicable to the combined plant, permitting most of the auxiliaries to be motor-driven without loss of heat for feed water.

SIX-CENT FARE QUESTION

The six-cent fare has been made the unit on the Brockton and Plymouth street railway at Plymouth, Mass., and the general managers of the road, Stone & Webster of Boston, write that the new rate has been in operation so short a time that comparative figures of earnings would be of little value, especially with the prevailing business conditions. Quoting their own statement, "We can simply state, in a general way, that we do not believe the six-cent fare has materially reduced riding of itself, and we can certainly see nothing that looks like a decrease in pleasure riding on Sundays and holidays. That the gross earnings fail to show a 20 per cent. increase, that being the percentage of increase in rate of fare, is due, we believe, to business conditions more than anything else."

ELECTRIC POWER IN COPPER SMELTING

A great electrically operated smelter is that of the Steptoe Valley Smelting and Refining Company at McGill, Nev. The ore handled is a copper sulphide varying in form, but comprising for the most part of finely divided material. It averages about 2½ per cent. copper.

The electrical supply for the plant is generated at 660 volts, transmitted to the concentrator at 13,200 volts and stepped down to 550 volts, at which all the motors, which are of the Allis-Chalmers three-phase induction type, operate. The power plant has a total capacity of 4,600 kilowatts, consisting of two 800-kilowatt units and two 1,500-kilowatt units, respectively, direct-connected in pairs to cross-compound Corliss engines.

All the concentrator machinery is driven by motors, distributed as follows:

First floor—Six sets of rolls and 24 trommels driven by two 150-horsepower motors; 24 jigs and 27 Wilfley tables, driven by one 75-horsepower motor; two elevators, each driven by a 10-horsepower motor.

Second floor—Eight Huntington mills driven by two 75-horsepower motors; four elevators and eight Callow screens driven by four 10-horsepower motors; 79 Wilfley tables driven by a 75-horsepower motor.

Third floor—Ninety-six Frue vanners driven by a 75-horsepower motor.

From the concentrator the product is hauled to storage bins at the roaster, where, after being roasted and mixed with the proper amount of flux, it is conveyed to the reverberatory building and treated (according to its nature) in either the blast or reverberatory furnaces. Here, it may be noted, three 400-horsepower Babcock & Wilcox boilers are installed to utilize the waste heat from the furnaces.

The resulting matte, which carries about 50 per cent. copper, is carried hot to the converter building, where there are three stands for 96 by 150-inch Leghorn converters, having a combined capacity of 85 tons of blister copper daily. A 60-ton Shaw crane equipped with five electric motors, carries the converter to the pouring stand, where the copper is cast into ingots averaging 95 to 99 per cent. of the pure metal. This final product is shipped for refining to Perth Amboy, N. J.

MAGNALIUM

A new and interesting alloy, similar to aluminum in many desirable properties, yet possessing superior advantages of strength and ease in working and machining over the pure metal, is a mixture of aluminum with magnesium, the proportion of the latter being from two to 10 per cent. The alloy is manufactured in Germany, and the following notes of its interesting properties were supplied by Mr. Morris R. Machol of New York, who is the American agent of the Magnalium Syndicate of Berlin, Germany.

Magnalium is imported in pigs or ingots for castings or forgings and can be handled by the ordinary foundryman or blacksmith. It may be forged nearly like Swedish steel. It can be delivered in plates, bars, rods, wire, tubing, etc., and shows a greater strength than aluminum in spite of its being slightly lighter, as its specific gravity is about 2.5, while that of pure aluminum is 2.64.

Magnalium can be worked or machined similarly to brass, giving a smooth surface of silvery color. Clean, sharp holes can be bored and perfect screw threads can be cut in the metal. The finest files can be used on it successfully. The tool speed is about twice that of aluminum.

It attains and maintains a high polish, resists oxidization, is unaffected by dry or damp air, water, gaseous ammonia, carbonic acid, sulphuretted hydrogen and most organic acids. It is very slightly affected by saltpeter or sulphuric acid and more rapidly by alkalies or strong alkaline solutions. It is slightly attacked by salt water and should be lacquered where it is exposed to sea water. The alloy is very close grained and can be polished, etched, engraved, pickled, etc., without any trouble. It is very ductile and can be forged, rolled, annealed or drawn.

Magnalium, unlike aluminum, can be soldered by the ordinary workman with magnalium solder after a little practice.

Its electric conductivity is 56 per cent. of that of pure copper. The melting point is 1,185° to 1,250° F. and the specific heat 0.2185.

A NEW FORM OF DIRECT-CURRENT AMMETER AND VOLTMETER

By P. MacGahan

There exists a considerable demand for a line of small direct-current switchboard ammeters and voltmeters of high grade and accuracy, yet so constructed as to be low in price. Heretofore low-price instruments, especially those of small size, have been built on the "moving-iron" principle, the cost of the permanent-magnet type construction having been considered prohibitive for this class of service.

However, it is universally conceded that for direct-current service the permanent-magnet, moving-coil construction is superior to the moving-iron type, being more accurate, naturally aperiodic or "dead beat," more free from external-field and temperature effects, taking less energy, and also showing polarity. The energy taken is much lower than in moving-iron instruments, allowing operation of ammeters from shunts; moreover, there are none of the residual errors which are present, to a certain extent, in moving-iron instruments.

Recent improvements in factory methods and in design features by the Westinghouse Electric and Manufacturing Company have rendered possible the production of a small-sized switchboard instrument

Fig. 1. Exterior View

Fig. 2. Manner of Removing Permanent Magnet

Fig. 3. View Showing Mechanism

NEW DIRECT-CURRENT INSTRUMENT

of the permanent-magnet type at a price as low as that of the best moving-iron instruments previously available. These instruments are made as ammeters and voltmeters, and are mounted in neat black electrose cases, five inches in diameter, rear connected, with circular beveled-glass front-plates.

The use of a case made from insulating material instead of metal gives a degree of insulation not usually found in small instruments. Owing to the peculiar self-shielding form of the permanent magnets, an iron case is not necessary for shielding against the effects of external fields. The meters are supported by means of brass studs projecting from the rear of the case, serving at the same time as terminals.

The voltmeters are made self-contained, including resistance, in any capacity as high as 300 volts, and the ammeters are operated from external shunts, the shunts of the capacities up to and including 75 amperes being mounted directly on the meter studs. The scale divisions are uniform, and the total length is almost the same as that found in the usual 7-inch diameter meters.

From a technical point of view, the most interesting feature of these instruments is the "single air-gap" type of construction, which differs considerably from the original D'Arsonval bipolar magnet with two cylindrical air gaps in series.

The principal advantages of the single air-gap construction in permanent-magnet meters are as follows:

1. The possibility of removing the moving element from the magnetic structure without interfering with the magnets or removing their pole pieces.
2. The coil balancing the weight of the pointer.
3. Single air gap means that larger air-gap clearances may be used without making the total magnetic reluctance of the air gap too high.

The removability of the permanent magnets is of much importance to the user who desires to do his own repair work on the premises.

Fig. 1 shows the general appearance of the voltmeter; Fig. 3 gives an internal view of the meter mechanism with the case removed, while Fig. 2 indicates the process of removing the permanent magnets when repairs become necessary.

The principal applications for this class of instrument will be for small panels, such as for rectifier outfits, battery charging, small isolated plants, small marine plants, or even on regular large switchboard work, where a small-sized instrument is desirable. The low price is due to the economic disposition of the material used, the light weight, and the fact that there are no hand operations used in manufacture, aside from the assembly. The parts are all machine-made in large quantities, with a highly organized and accurate tool equipment, the assembler merely attaching these parts together without further fitting.

PRODUCTION OF COAL

In the production of both anthracite and bituminous coal Pennsylvania in 1907 exceeded any previous annual record, as reported by Mr. E. W. Parker to the United States Geological Survey. The total production was 235,925,749 short tons, having a spot value of $319,421,826. The production of anthracite was 76,432,421 long tons (equivalent to 85,604,312 short tons), having a spot value of $163,584,056. The production of bituminous coal was 150,321,437 short tons, having a spot value of $155,837,770.

The prices of both anthracite and bituminous coal in Pennsylvania were higher in 1907 than in 1906. The average price of anthracite was $2.35 per ton, an increase of five cents; the average price of bituminous was $1.04 per ton, an increase of four cents.

Until 1902 Pennsylvania produced each year more than half the coal mined in the United States, but since then the state's output has fallen below one-half, by reason of the great increase in production in other states.

Mr. M. R. Campbell of the United States Geological Survey estimates the amount of coal originally in the anthracite fields of Pennsylvania at 21,000,000,000 short tons and that in the bituminous fields at 112,574,000,000 short tons. It is said that, by the methods of mining anthracite coal in former years, for every ton of coal mined and marketed 1½ tons were either wasted or left in the ground as pillars for the protection of the workings, so that the actual yield of the beds was only about 40 per cent. of the contents. This percentage of waste has now been materially reduced, but the exhaustion to the close of 1907 has probably amounted to about double the production, or 4,000,000,000 short tons. This would leave still in the ground approximately 17,000,000,000 tons, which would be capable of yielding, at the rate of one ton of coal lost for each ton mined, 8,500,000,000 tons, or approximately 100 times the quantity of anthracite produced in 1907.

Estimating for the bituminous production one ton of coal lost for every two tons mined, the exhaustion to the close of 1907 has been 2,760,000,000 tons, which would leave still in the ground in Pennsylvania a little less than 110,000,000,000 short tons of bituminous coal. The annual production and consumption of coal will no doubt continue to increase, but at the rate of production reached in 1907 the available supply in Pennsylvania would last about 490 years.

The total production of coal in Illinois in 1907 was 51,317,146 short tons, having a spot value of $54,687,382, the largest production and value yet recorded for the state, an increase of 9,837,042 short tons, or 23.72 per cent. in quantity, and of $9,924,320, or 22.17 per cent in value, over the production of 1906. By this increase Illinois was again advanced to second place among the coal-producing states, a position it had held from 1883 to 1906, when it was supplanted by West Virginia.

Illinois contains more coal-producing counties than any other state in the Union, 52 counties having produced 1,000 tons or more each in 1907. Of these, there were two whose production in 1907 exceeded 5,000,000 tons—namely, Sangamon, 5,160,042 short tons, and Williamson, 5,697,944 tons.

West Virginia reports a total production of coal in 1907 of 48,091,583 short tons, having a spot value of $47,846,630. West Virginia is one of the producers of high-grade steaming and coking coal. The influence of the monetary disturbance of October was keenly felt. Coke making fell off quickly as soon as the depression began, and the coal production of the state during the last 10 weeks of the year was probably not more than 50 per cent. of the capacity.

West Virginia differs from many of the other important coal-producing states in that, except for the coal which is consumed by the railroads, a comparatively small amount used for manufacturing purposes, and that which supplies purely domestic consumption, practically all of the product is shipped outside of the state.

Although a good part of the market in California for coal from the state of Washington has been lost through the increased production of fuel oil in that state, Washington shared in the general increase in the production of coal in 1907. The total output for the year was 3,680,532 short tons, having a spot value of $7,679,801, an increase of 404,348 short tons, or 12.34 per cent. in quantity, and of $1,771,367, or 29.98 per cent. in value, compared with 1906. The average price per ton advanced from $1.80 in 1906 to $2.09 in 1907.

The coal beds of Washington are found in the western and central portions of the state, and are mined in five principal fields. The coals of Washington range from lignite to bituminous coking coals, and include some natural coke and anthracite. The bituminous coking coals of Washington are the only coking coals on the Pacific slope of the United States. The steamship consumption in the trade with Alaska and the Orient is now the most important market for the high-grade bituminous coals of Washington.

Last year there was produced in Ohio a total of 32,142,419 short tons of coal with a spot value of $35,324,746. This was an increase over 1906 of 15.91 per cent. in quantity and of 16.4 per cent. in value. In 1907 the coal-mining industry in Ohio was not greatly affected by labor troubles or strikes, the car supply was more nearly adequate than in some other states, and the average prices were satisfactory to the operators. The number of men employed in the mines was 46,833 and the average working time was 199 days during the year.

Ohio leads all other coal-producing states in the percentage of the total product which is mined by machines. There were 1,328 machines in use in 1907, and the machine-mined product amounted to 77.29 per cent. of the total output. In 1906 the percentage was 72.14 and in 1905 it was 66.1 per cent. of the total product, thus showing a steady increase in the use of machinery. Some of the coals of Ohio are celebrated for certain uses. That of the Hocking Valley region is a free, open-burning coal, highly regarded as a steam and domestic coal, but more popular as a furnace fuel, for which purpose it is used raw. The block coal mined in the northeastern counties of the state is very pure and is utilized principally in making pig-iron, for which it is used in its raw state in the blast furnace.

In the new state of Oklahoma the total production of coal in 1907 was 3,642,658 short tons, having a spot value of $7,433,914. This is an increase of 27.36 per cent. in quantity and of 35.6 per cent. in value over the preceding year. Only three states exceeded Oklahoma in percentage of increase in 1907 over 1906. These were Michigan, whose production increased 51 per cent.; Arkansas, which had an increase of 43.3 per cent., and New Mexico, with an increase of 33.8 per cent.

At present the entire Oklahoma coal output is derived from what were formerly known as the Cherokee, Creek and Choctaw nations of Indian Territory. The coal beds underlie an area of about 20,000 square miles. The falling off in the production of petroleum in Texas and the constant advance in the price of oil have naturally created a better demand for Arkansas and Oklahoma coals in the territory tributary to the coal fields of those states, and unless the conditions change in this respect, the production of this region may be expected to increase, provided, of course, that normal industrial conditions continue.

Reports from Oregon show that the total production of coal in 1907 was 70,981 short tons, having a spot value of $166,304. The only productive coal field in Oregon is situated in the southwestern part of the state, in Coos County, and occupies a total area of about 250 square miles. As practically all of the product from Coos Bay has been shipped by water to San Francisco, the substitution of oil for coal in most of the manufacturing industries of that city has cut off a considerable portion of the market for this coal. The effect on Oregon's production is shown in a decrease from 109,641 tons in 1905 to 79,731 in 1906 and to 70,901 in 1907. The decrease in value of the 1907 product was even more pronounced, for while the production showed a decrease of 10.97 per cent., the value declined 21.68 per cent.

A NEW BATTERY-CHARGING RHEOSTAT

A new departure in the design of rheostats to control charging current for storage batteries has been made by the Ward Leonard Electric Company of Bronxville, N. Y. In the new device, which is known as the Ward Leonard MC type rheostat,

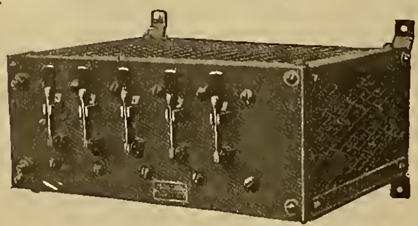


FIG. 1. NEW BATTERY-CHARGING RHEOSTAT

there are several switches in parallel, each switch controlling its respective resistance. Each resistance is designed to carry the maximum amperes that can be made to pass by the maximum volts that can be applied. A given minimum number of cells of battery has a fixed minimum voltage; and when in charging these minimum volts are opposed to the line of charging volts, the difference between the battery volts and the line volts is the maximum volts that can be applied to the rheostat.

To secure any charging amperes within the rating of the rheostat it is merely necessary to close the proper switches. There are five switches, giving 31 steps of control. Each switch is marked with the approximate amperes that will pass when it is closed, all the other switches being open. By reading the switch markings the approximate charg-

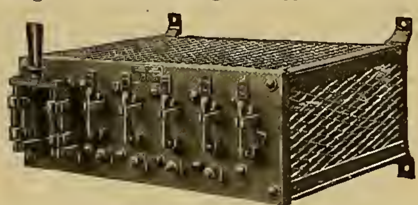


FIG. 2. BATTERY-CHARGING RHEOSTAT WITH LINE SWITCH AND FUSES

ing amperes may be seen at a glance. It is impossible to produce an overload through the circuit, so that the cells are thoroughly protected from abuse.

The resistance elements are the standard Ward Leonard enameled resistance units. They are fireproof, strong and light, and are protected against chemical, electrical and mechanical depreciation. Any rheostat of the MC type, designed for a minimum number of cells, can of course be used to charge a greater number of cells, but at a slightly decreased charging rate.

For example, 12 cells is the minimum number of cells used in electric carriages. Therefore, the minimum battery volts is approximately 24 volts.

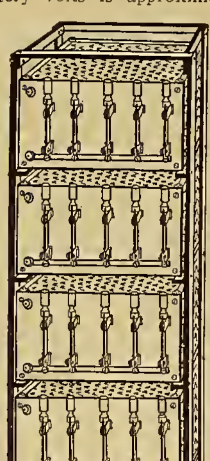


FIG. 3. BATTERY-CHARGING RHEOSTATS FOR USE IN GARAGE

Twenty-four volts opposed to a 120-volt line circuit leaves 96 volts to be used up in the rheostat. For pleasure carriages 40 amperes is the maximum charging amperes. An MC rheostat as described, for 12 cells and 40 amperes charging rate, has each switch and its resistance designed to be connected across 96 volts, and when all the switches are closed 40 amperes will pass through the circuit. Such a rheostat can be used to charge the following number of cells at the following charging rates:

With 12 cells in circ. a max. charging rate of 40 amp. is obtained
With 24 cells in circ. a max: charging rate of 38 amp. is obtained
With 30 cells in circ. a max. charging rate of 28 amp. is obtained
With 36 cells in circ. a max charging rate of 22 amp. is obtained
With 40 cells in circ. a max. charging rate of 18 amp. is obtained
With 44 cells in circ. a max. charging rate of 15 amp. is obtained

Such a rheostat designed for any fixed number of cells seems absolutely "fool-proof."

Fig. 1 shows the MC type rheostat as described; Fig. 2 represents this same rheostat with a line switch and fuses added, making a complete installation, and Fig. 3 shows a bank of the rheostats for garage service.

TEST OF BONE COAL IN PRODUCER

A forthcoming bulletin of the United States Geological Survey will contain an exhaustive report of the tests conducted at the fuel-testing plant in St. Louis, Mo., and Norfolk, Va., on the gas producer. An interesting feature of the report will be the behavior of a certain bone coal from West Virginia in the producer. This fuel was considered of little or no value for steam-boiler work, yet showed considerable usefulness in the gas producer, developing at the engine a brake horsepower per hour for 1.65 pounds of coal.

This coal was delivered on the producer platform in lump form up to 8 or 10 inches in size. The coal crusher not being available, at the time, necessitated breaking the large lumps with a hammer. The character of the fuel was rather peculiar; some of the lumps consisted almost entirely of what appeared to be a high-grade bituminous coal, others seemed to be nothing more or less than rock, heavy and hard, which, when hit in the dark with a hammer, gave off numerous sparks. There were many lumps of this rock-like substance to which adhered much good coal. In the producer all of these lumps, when not too large, would burn entirely through. The fuel had no tendency to clinker or coke and worked exceedingly well, needing scarcely any poking. It contained a very high percentage of ash (about 45 per cent.), causing the ash bed to increase in thickness very rapidly, and throughout the test this fact was not properly appreciated; consequently much of the time during the test the ash bed was too high for best results. The fact that the coal had to be broken by hand and that it was unusually hard and rock-like, had a tendency to allow lumps of coal much to large to be charged into the producer. These large lumps, very high in ash, did not burn entirely through; as soon as the burning was well started, a layer of ash formed around the lump, interfering with the combustion of the remaining portion, and before it had time to burn it had passed out with the ashes unconsumed. Because of the general appearance of the coal, but little was expected of it, and the test was started with only partial load. After several hours' run, however, the results warranted full load on the engine. After 39 hours of full load the accumulation of ash in the producer caused a little trouble; the gas went down in heat value, and it was necessary to reduce the load to about nine per cent. of full load. After much grinding down of the ash bed and special care in breaking up the lumpy coal, the gas began to increase in heat value, and at the end of the test the producer was again in shape to maintain full load at the engine. The calculations for the test are based on the 50 hours taken from the time full load was carried by the engine, and for this period the gas averaged 144 B. T. U. per cubic foot, with an average load of 97 per cent. of full load.

The following is the result of the test on the West Virginia bone coal:

PROXIMATE ANALYSIS OF THE COAL.

Moisture	0.47
Volatile Matter	8.83
Fixed Carbon	46.96
Ash	43.74
	100.00
Sulphur	0.27

COMPOSITION OF GAS BY VOLUME.

Carbon Dioxide (CO_2)	9.7
Carbon Monoxide (CO)	19.5
Hydrogen (H_2)	16.6
Methane (CH_4)	1.6
Nitrogen (N_2)	52.6
	100.00

Duration of test	50 hours
Coal consumed in producer, as fired, lbs. per hour	378
B. t. u. of coal as fired	8,566
Standard gas per lb. of coal consumed in producer cu. ft.	44.1
Efficiency of conversion and cleaning gas	74.1
B. H. P. developed at engine	228.8
Coal per B. H. P. hour developed at engine, lbs.	1.65

The estimate of the brake horsepower is based on an assumed efficiency of 85 per cent. for generator and belt.

NEW SECTIONAL CONDUIT BOX

The Chicago Fuse Wire and Manufacturing Company is placing on the market a new conduit box, No. 160, embodying the sectional gang idea employed in its well-known type AA and BB boxes for flexible conduit. A box for any number of gang switches can be built up from a two-gang box, shown in Fig. 1, by loosening the screws and

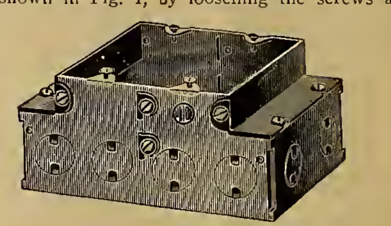


FIG. 1. TWO-GANG SECTIONAL BOX

inserting spacers. The box and cover part of the spacer are formed of one piece, and the only detachable parts on top are the small end cover plates, which may be removed without taking out a screw, thus permitting ready access to the bushings of the end conduits and also allowing examination of wires without disturbing switches.

Fig. 2 shows a three-gang box with spacer in place. The hook-eye construction enables these

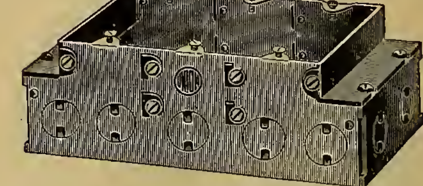


FIG. 2. THREE-GANG BOX MADE FROM TWO-GANG AND SPACER

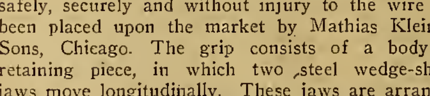
boxes to be assembled without removing a single screw. The tight box meets the requirements of the underwriters, as filling the need of electrical contractors for a sectional gang conduit box in which there is ample room for conduit connections, wire joints, etc. This box makes an excellent junction box when equipped with a flat cover, and is particularly suitable as a cut-out box, being designed to accommodate the single and double-pole main-line blocks and also several single and double branch cut-outs manufactured by this company.

Each spacer is provided with two knockout plugs for one-half-inch or three-fourths-inch conduit, as specified, while each box portion is equipped with six such openings.

The spacings between switch lug centers are standard, so that all gang switch plates fit perfectly. The advantage of this construction over the single-piece gang boxes must appeal at once to every user of conduit boxes, as it enables one to meet any demand for gang boxes with only a stock of two-gang boxes and spacers.

A NEW STRAND-WIRE GRIP

A device to handle strand or messenger wire safely, securely and without injury to the wire has been placed upon the market by Mathias Klein & Sons, Chicago. The grip consists of a body or retaining piece, in which two steel wedge-shape jaws move longitudinally. These jaws are arranged so as to move in either direction simultaneously,



A NEW STRAND-WIRE GRIP

thus opening or closing them in unison. The gripping surface of the jaws is concave, and is provided with a series of milled teeth, spread over their entire length. These teeth grip into the spirals of the strand, and being uniformly distributed over the entire length of the jaw, grip the wire at very many points, thus taking a secure hold, with the pressure distributed along the entire length of the gripping surface, so that no amount of strain falls sufficiently at one point to crush or injure the wire. The tackle is attached to the two oblong rings in the body piece; these rings being arranged central, insure a straight pull. The proportions of the various parts are calculated to carry any strain that is necessary to tighten the wire, and the jaws are self-adjusting to accommodate sizes from five-sixteenths to one-half inch.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, July 16.—An enterprise of considerable importance in the field of radio-telegraphy will probably be carried out by Victor Popp, a leading promoter of electrical affairs at Paris, who is at the head of the Wireless Telegraph Company. The Spanish representatives of the company have obtained the concession for erecting 24 wireless posts on the coast of Spain and also in the Balearic Islands and the Canaries. The chain of stations will be especially valuable in giving communication between ships and the Continent. As many as 200 vessels pass daily through the Strait of Gibraltar, from the Atlantic to the Mediterranean, and vice versa. The Wireless Telegraph Company has now secured the monopoly of communications in this region, which is an important strategic position. All the ships which pass from the north of Europe to South America or to Africa and also those which come from the Orient or the Far East will no doubt make use of the present system in order to have a connection with the Continent. The new posts will be erected not only in Spain but also in Morocco, it is said. The first station will be located at Cadiz, and it will have a 2,000-mile range, being in connection with one in the Canaries. The latter post will be of an exceptionally high power, and is to be placed at the foot of Teneriffe Peak. It will send messages to a distance of 6,000 miles, it is hoped, and thus may connect with Brazil and other points of the South American coast. Where an ordinary cable message sent from Paris to Brazil now costs 75 cents a word, the new system will reduce the cost to 25 cents a word.

A standard-gauge electric railroad is to be built in the region of Agostonfalva, Hungary, and the rights for the line have been granted by the government to the Erdövideker Mining Company. The electric road will run from the above-mentioned point, which is a station on one of the principal railroads, to the locality of Vargyas. Parliament is to decide shortly as to the question of granting the concession for an electric railroad running from Pozsony to the frontier. Another electrical enterprise in the same country is an increase in the lighting and power plant which it is proposed to carry out before long in the town of Nagybecskerek. The municipality has advertised for bids to this effect.

Experiments have been carried out in Spain with a new electric indicator invented by Daft and Williams, for discovering ore deposits. A number of tests of the apparatus were made not long since in the mining district of Huelva, and are said to have given very good results. Following this, another set of experiments is being made at the Azuage mines.

Among the new central stations which are now being erected in various parts of Spain I may mention the new city plant at Bilbao, and a new station located at Valladolid. At Seville there is a new plant building at present by the Co-operative Electric Company. There are also new stations in the towns of Palencia, Mondonedo and Soria.

In Asiatic Turkey, the town of Tarsos, in the Adana province, will be one of the first in the country to use a hydraulic plant for operating a light and power distribution in this locality. The turbine plant is located at some distance from the town, and the municipality has already advertised for bids from the leading electrical firms. Later on, measures will be taken for lighting the towns of Adana and Mersina. A. DE C.

GREAT BRITAIN

London, July 18.—What must be regarded as the most serious fire that has yet occurred upon a London tube railway took place yesterday upon the City and South London Railway at Moorgate Street. The reason assigned to the fire at present is that a cable short-circuited and set fire to the wooden ties and an old disused signal box, with the result that the tunnel was filled with smoke, although fortunately nothing approaching a panic took place. The driver of a train appears to have noticed a red glow ahead of him and at the same time detected smoke. With great promptitude he emptied the train of passengers at the station, and they all were got into the street without much difficulty, although the smoke was troublesome. The current was immediately cut off the particular section and the fire brigade called in. The fire had to be attacked from the preceding station, as the smoke was too dense and suffocating for the firemen at the Moorgate Street station. Consequently some two miles of hose pipe was brought into use, and, once the men got at close quarters, there was not much difficulty, but smoke helmets had to be requisitioned. The ties are made of Jarrah wood. Altogether, some 50 yards of the permanent way was damaged.

Some of the noteholders in the Underground Electric Railways Company of London, who object to the scheme recently put forward for saving the company from a very awkward financial position, took their opposition to the courts this week, but after hearing all the facts of the proposition, the judges decided that the scheme was in the best interests of all concerned. They therefore confirmed the scheme by which the profit-sharing notes will be met, the holders taking proportions of other stock at a premium.

The bill which has been promoted in Parliament for the utilization of the peat bogs of Ireland, in conjunction with the generation of electric power, has had a somewhat stormy career. But it has finally passed both houses, and there seems nothing now to prevent the promoters putting a very interesting proposition into working order if they can get their capital.

Although electric-supply authorities in England have fallen upon days of enthusiasm for publicity methods, as they are sometimes called, it is nevertheless interesting to hear that the Worcester electricity committee has proposed to hire out its street lamp posts for the accommodation of electrical advertising signs.

A mining exhibition is now in progress in London, and naturally contains a good deal of interest in so far as the application of electricity is concerned. But, although there is much to be seen there from the point of view of electrical engineer, there is probably more to be seen in practical applications throughout the country than is actually represented at the show. To a large extent, at any rate in the heavier branches, this class of work is in the hands of comparatively few firms, and since the committee appointed by the Home Office a few years ago issued its regulations, the tendency of design has been to conform with these, and considerable evidence of this is to be seen at Olympia, where the exhibition, which is the fourth of its kind, is being held.

An interesting proposal has been seriously put before the Dundee Corporation by the tramways committee, and that is the use of trolley omnibuses on the outskirts of the town. A deputation from the Town Council has visited the Continent and has reported strongly in favor of them. At Sheffield, too, there has been some controversy as to the desirability of certain tramway extensions, and it is quite possible that the subject will be taken up there. At Dundee three vehicles are in contemplation at an estimated cost of $3,000 each.

One of our oldest electrical manufacturing firms is about to disappear, in the formation of a new company, the main function of which will be the manufacture of reciprocating pumps. It is felt that there is more profit in this direction than in the manufacture of purely electrical machinery, although a certain amount of electrical machinery will still be manufactured. The firm in question is Thomas Parker, Ltd., of Wolverhampton.

For a company which is to be purchased in 1911, the National Telephone Company is in a particularly flourishing condition. The accounts show that there is a reserve fund of nearly $15,000,000, and that for the June half-year there was a net profit of about $2,250,000. G.

NEW ENGLAND

Boston, July 25.—The New England Investment and Securities Company, which is the holding corporation in this state of the electric railways recognized as the New York, New Haven and Hartford properties, has decided to move from its quarters in the South Terminal Station in this city, where it was in close touch with the New Haven officials, and establish headquarters in the city of Springfield, Mass. This big company, which controls electric railways and power and light companies in various parts of the state, is not quite sure of its status at the present time on account of the stir that has been occasioned in Massachusetts during the past two or three years over the New Haven's expansion policies, but it was deemed best to avoid further semblance of New Haven affiliations so far as separation of the offices would affect the matter, at least.

It is said that the Metropolitan Home Telephone Company, which in December, 1906, secured a unique franchise from the city of Boston as a competitor of the New England Telephone and Telegraph Company, is about ready to file the $50,000 bond with the city which is a requirement preliminary to its commencement of construction work.

The freight-carrying privilege continues to be extended, the Springfield and Eastern trolley system being granted the right for a part of its lines this week.

At the end of the first half of the calendar year the New England Telephone and Telegraph Company had 233,731 stations, an increase of 5,870 over the number at the beginning of the year. Counting in the Southern Massachusetts company and sublicensees, there were 296,226 telephones connected with its lines.

The Edison Electric Illuminating Company of Boston shows gross earnings for the fiscal year to June 30th of approximately $4,242,000, a gain over the previous year of 5.4 per cent. At the close of the year the total connected load on the system in 16-candlepower equivalents was 1,638,544, a gain of nine per cent. over the preceding year.

An appeal was entered on July 22d in the Massachusetts Supreme Court from the final decree in the case of the attorney-general versus the New York, New Haven and Hartford Railroad Company relating to the trolley mergers. The appellant says the decree is uncertain and vague, and that it is liable to be adjudged in contempt on account of inability to understand the true intent and meaning of the decree. B.

NEW YORK

New York City, July 25.—After a battle between 50 employes of the New York City Railway Company, a force of employes of the Third Avenue Railroad Company and 20 policemen, an effort made by the Federal receivers of the New York City Railway Company to tear out the feed cable which supplies power to the Fifty-ninth Street cross-town line was frustrated at Fifty-ninth Street and Third Avenue Monday night. If it had been successful the operation of all electric cars on the Fifty-ninth Street cross-town line would have stopped immediately, and thousands of New Yorkers would have been inconvenienced. The police balked the scheme, however. The cable runs from Fifty-ninth to Sixty-sixth Street in the same conduit as the service wires of the Third Avenue Railway, and it was sought to cut the feed cable through the manholes along Third Avenue.

The Coney Island and Brooklyn Railroad is installing a number of improvements that will cost more than $1,000,000. Burying of overhead feed wires is now practically completed. A conduit has been laid along the entire system from Coney Island and the cables installed. At the new power plant being erected at Smith and Ninth streets the entire power to run the lines of the road will be generated. The company has been operating a five-cent fare to Coney Island on holidays, and is now taking up the matter of an increase to 10 cents with the Public Service Commission.

The report of the Kings County Electric Light and Power Company, including the Edison Illuminating Company of Brooklyn, for the six months ended June 30, 1908, shows gross earnings of $1,776,722, an increase of $103,887; net of $952,062, an increase of $125,304, and surplus after charges and dividends of $53,784, an increase of $44,818.

Henry B. Seaman, chief engineer for the Public Service Commission, has informed the commissioners appointed to consider changes in the Broadway-Lexington Avenue subway that the changes would lessen the danger of operation and also tend to increase the speed of trains. Much money also would be saved, Seaman asserted, by the modifications proposed.

Because Beverly W. Reynolds had been suspended as superintendent of the Westchester Electric Railway Company by Addison Young, receiver for the company, 500 street-car men went on a strike which lasted 11 hours, until Mr. Reynolds heard of it and advised the men to return to work, telling them not to sacrifice themselves on his account. The strike caught tens of thousands of persons in all parts of Westchester County without warning, and commuters were greatly delayed and inconvenienced in catching trains for New York in the morning. Mount Vernon, Pelham, Pelham Manor, New Rochelle, Larchmont, White Plains and Tuckahoe were among the chief places affected. About 20 different lines were tied up.

In addition to building a half-million-dollar trolley-car terminal over the Hudson tunnel entrance at Hoboken, N. J., the Public Service Railway Company is making plans to construct a larger and more costly terminal at Exchange Place, Jersey City, where the main tunnel station on the New Jersey side of the river has been constructed under the Pennsylvania Railroad station. An entrance opening on Exchange Place has been constructed.

The engineers of the New York, New Haven and Hartford Railroad, in their investigation into the cause of the fatal wreck of the White Mountain Express at Greenwich recently, are devoting attention to the electric-motor cars with which the New Haven system is equipped. The question has been raised as to whether the shortness of these motor cars could be responsible for the spreading of the rails under the White Mountain Express. W.

SOUTHEASTERN STATES

Charlotte, N. C., July 25.—A new development in the electrical field in North Carolina is made public by the announcement of the chartering of the Charlotte Power Company, Charlotte, N. C., by capitalists, including several large stockholders in the Southern Power Company. The capital stock is $300,000 to begin with, and the company is empowered to operate electric railways, lighting plants, etc. An extensive development in the construction of interurban railways is believed to be one of the main objects of the new company. Power from the various plants of the Southern Power Company will be available for the purposes of the new concern.

After some efforts on the part of the Chamber of Commerce at Raleigh, N. C., the promoters of the electrical development of Buckhorn Falls, near Fayetteville, N. C., have had a preliminary survey made, and may transmit power to Raleigh for electrical purposes. Several manufacturing plants have signified their intention, it is said, to contract for power in amounts ranging from 1,500 horsepower down. The Central Carolina Power Company, which has completed the building of its large plant at Buckhorn Falls, has been granted right to change its name to the Carolina Light and Power Company, and to increase its capital from $1,000,000 to $3,750,000. The principal offices will be moved from Fayetteville to Raleigh.

The electric-lighting plant at Swainsboro, Ga., owned by Jesse Thompson, has been offered for sale by the owner on the first Tuesday in August, and, unless the town purchases the plant, the latter may be closed. A 1,300-light dynamo and appurtenances constitute the main part of the property.

The Rock Springs Electric Company of Strasburg, Va., has been incorporated with a capital of $10,000 to $25,000 by B. H. Bowser, president, H. H. Copp, vice-president, C. M. Chiles, secretary, all being residents of Strasburg. The concern proposes to conduct the business of an electric-light company.

It is said that the recent issue of $1,500,000 bonds of the Bibb Power Company, Macon, Ga., has been floated in New York city. Power is being developed at Jackson, Ga., where a large dam is under construction.

After extended negotiations, the development of Horseford Shoals, near Hickory, N. C., is practically povided for. The plant is to supply power to Hickory, Lenoir and other towns. The development has been in the hands of Col. M. E. Thornton, who has placed much of the stock locally, and it is understood that the directors are to be selected from these local stockholders, leaving the plant in control of these. D. H. L.

OHIO

Toledo, July 25.—The competition between the steam and electric railroads of northwestern Ohio, entering Toledo, has become so sharp that it has almost reached a white heat. People residing in the northern section of Ohio, and portions of Indiana and Michigan, will have the advantages of a rate less than one cent a mile during the National G. A. R. Encampment. It is not yet known whether the low rate will hold for points from a distance.

The Toledo Home Telephone Company, which began giving service in August, 1902, has grown until it is now supplying about 12,800 telephones. According to its last report its gross earnings for the last year were $31,296.75 in excess of its expenditures.

The motorman in charge of a car between Toledo and Findlay, Ohio, was attacked by a bat which flew in the front vestibule. The car was running 20 miles an hour when the little animal fastened itself on the neck of the motorman. The assistance of the conductor was required before the bat could be removed.

It is said that the Toledo and Chicago Interurban Company will be reorganized under the laws of Indiana and take over the rights as soon as the present receivership is wound up. This project was originally considered one of the most important of its time. A portion of the line which has already been completed touches Kendallville and Auburn, Ind., and has been in operation for more than a year. F. E. Seagrave of Toledo was formerly interested, and F. B. Perkins of Toledo was engineer and general manager. S.

MICHIGAN

Detroit, July 25.—The City Council of Iron Mountain has arranged a contract for street lighting and lighting of public buildings with the Iron Mountain Light and Power Company. The contract provides for 70 6.6-ampere street lights of the latest enclosed type at a rate of $75 a year, moonlight schedule.

The Milford Council has granted a franchise to the Interstate Telephone Company. The Holly Council has refused a franchise to the same company.

The village of Birmingham has granted a 30-year franchise to the St. Clair Edison Company to run its poles and lines through the village.

Work on the Michigan and Indiana company's dam will be completed within a month, and the rebuilding of the dam at Buchanan, which was carried out by washout, will be completed about the first of October. The company will then be in a position to supply about 35,000 horsepower from the St. Joseph River.

The village of Plainwell has granted a franchise to the Grand Rapids Electric Company for an electric road through Plainwell from Kalamazoo to Grand Rapids.

The Escanaba Pulp and Power Company has been incorporated under the laws of Michigan, it being formerly a Wisconsin corporation. The company will soon be ready to furnish power for the municipal plant.

The Mt. Clemens Council has postponed the action on the Independent telephone franchise, owing to the protest from the business men.

The Commonwealth Power Company has taken over the entire business of the Battle Creek Electric Company.

The surveys for the development of the Menominee River at Marinette are almost completed, and the Menominee-Marinette Light and Traction Company will begin the construction of the dam, power house and log flume.

The Michigan United Railway has ordered a number of new cars, and as soon as they are delivered the service on the entire interurban division will be greatly improved. D.

INDIANA

Indianapolis, July 25.—A gasoline-electric railway is proposed to connect Swayzee with Elwood. The line when built will be about 12 miles in length and will traverse a section of country not now touched by any railroad, and will connect with the Kokomo, Marion and Western electric railway at Swayzee and the Union Traction system at Elwood.

The Pennsylvania Railroad Company has decided not to test the law allowing cities and towns to compel by ordinance the maintenance of lights at street crossings, and has compromised with the city of Warsaw by placing four arc lights at prominent crossings. The traction companies of the state were hopeful the company would test the law in the highest court.

The courts of Indiana will decide whether a city has a right to discriminate against a private corporation in favor of a municipal competing plant.

An ordinance passed by the City Council of Richmond requires the Light, Heat and Power Company to place its Main Street wires underground, and the company has refused to comply with the ordinance on the ground that it is being discriminated against because the municipal-plant wires are not likewise required to be placed underground. The city contends that it is not required to place its wires underground, because a city cannot legislate against itself.

The Indiana and Michigan Electric Company of South Bend announces that the two dams in St. Joseph River are almost completed, and that the power house is finished and 24 of the 32 turbine waterwheels have already been installed. The electrical machinery is arriving and being installed as rapidly as possible. October 1st is the date set for starting this great 35,000-horsepower plant for furnishing power for the operation of the Southern Michigan electric railway, the Chicago, South Bend and Northern Indiana Railway Company's lines between Mishawaka and Goshen, and between Laporte and Michigan City and the Murdock system between Laporte and South Bend.

A new telephone company has been formed at Hillsdale, with D. B. Highfill president, and John Taylor, secretary. Wealthy citizens are giving aid to the new enterprise, and the work of construction is to be commenced soon. The new company grows out of the dissatisfaction over increased rates charged by the Hillsdale company.

The Central Union Telephone Company of Richmond has increased rates for local service to a point calculated to drive all its subscribers to the Richmond Home Telephone Company. It is believed this was done in order to carry out the "working agreement" entered into with the Home Telephone Company to quit the local-service field. S. S.

ILLINOIS

Peoria, July 25.—The Springfield Utilities Company is making several improvements in its city offices, making more room for the general office. Private offices for the officers of the company will take up the entire second floor of the building.

Congressman William B. McKinley, president of the Illinois Traction Company, has been in the city today on business regarding the franchise on Washington Street. The Peoria Terminal Railway Company has been running uptown on the Peoria Railway Company's lines at a high rental, and it wishes to come up Washington Street to the center of town. The franchise has been waiting for word from Mr. McKinley as to what the traction company would do, as this is the only street for interurbans to enter the city, without interfering with the regular street-car lines. At the conference it was decided to let the terminal company build the lines up Washington Street, the Peoria Railway Company agreeing to pay one-half of the cost of construction within one year, including the cost of the paving and the cost of the spur tracks that will be built. The intention now is to secure the consent of the property owners and ask the City Council for the necessary franchise and establish an interurban depot within 300 feet of the court-house.

The Buckeye Electric Company of Cleveland has been incorporated to do business in Illinois, with a capital of $6,000, in this state.

The last rail of the Mississippi Valley Railroad was laid this week, and the company is now operating the cars from Springfield to Hillsboro and Rochester. The regular service will be established next week. The line will be pushed into Pawnee as early as possible.

The Illinois Traction System, through General Manager L. E. Fischer, has placed an order with the Danville Car Company of Danville, Ill., for 10 new cars. Eight large interurban cars and two sleepers, as are used now on the lines between Springfield and St. Louis, make up the order. The sleeping cars will cost $20,000 each, while the interurban cars cost $15,000 each.

The City Council of the city of Springfield has passed the franchise granting the Springfield Consolidated Railway Company a 20-year franchise, which calls for the payment of two per cent. of the gross earnings to the city for the first 10 years and four per cent. for the remaining 10 years. The company is to sprinkle the residence streets twice each day and the business streets three times, for which the city is to pay the company $150 per year per mile and $225 per mile per year, respectively. The company has 30 days in which to accept it, which Vice-president Schmidt promises will be done. V. N.

WESTERN CANADA

Winnipeg, July 25.—Mayor Macdougall of Edmonton, Alb., is making an effort to have an electric-car service in operation in that city before fall. The latest proposition is to have a four-car service over the tracks already laid, increasing the system next year.

As a result of an agreement reached by arbitration, Fort William will pay Port Arthur $52,000 for that portion of the Port Arthur electric street railway running in Fort William.

F. G. Webber, provincial manager of the Bell Telephone Company for Alberta before the government purchased the system, has left for Montreal, Que., having accepted an important position in the head office of the company. R. A. Coquette, superintendent of construction, and G. Slingsby, manager of the exchange at Wetaskiwin, will also stay with the company, and have left for Montreal.

At a meeting of the Temiskaming Telephone Company, held at Haileybury, Ont., recently, it was decided to issue $20,000 of six per cent. debentures to pay off the indebtedness of the company. The several proposed routes to Silver Center were also discussed. It was decided to construct the line as soon as possible. R.

PACIFIC SLOPE

San Francisco, July 22.—It is announced that electric power from the generating plant upon Eel River in Mendocino County will reach Santa Rosa on August 1st. The contracts call for service by August 10th. The dam is located on Eel River. From Ukiah the high-tension line has been extended through Hopland, Pieta, Preston, Cloverdale and Geyserville and is nearing Healdsburg. From Healdsburg it will come through Windsor and Fulton into Santa Rosa. Santa Rosa is now lighted by power from the North Fork of the Yuba River, one of the longest transmissions in the world.

Dr. Carter of Tehama has filed on 10,000 inches of water in Mill Creek, to be used to operate machinery and for general electrical power.

The project for the construction of a series of wave motors for the generating of electric power, according to a system originated by George N. Todd, has been referred by the City Council to the city attorney of Santa Monica, Cal. He will investigate the proposition to ascertain how far it may conflict with state and federal regulations and private property interests. It is proposed to bond the city and to install a large plant that would supply electric power and become a source of revenue to the municipality.

The first official step toward authorizing the Southern Pacific Company to carry out its scheme of electrifying its system of local lines on the east side of San Francisco Bay was taken at a meeting of the City Council of Alameda, Cal., July 20th, when resolutions were passed granting the company permission to change its motive power from steam to electricity on two of the lines now in operation in Alameda.

The Home Gas and Electric Company of Huntington Park, Cal., has been incorporated with a capital stock of $25,000, by R. J. Dunn, J. M. Williams and M. P. Roberts of Los Angeles, and Horace Slater and W. S. Cramp of Redlands.

It has been reported in Reno, Nev., that the Nevada-California Electric Power Company has an option until August 1st on all the power interests of the Fleishhackers in Nevada and California. Since June experts have been going over the Fleishhacker interests, and it is now reported that the final arrangements will be made on the first of the coming month. Last month F. G. Baum, president of the Nevada-California company, spent several days in this section investigating conditions. The proposed acquisition is said to be but the beginning of a vast power and light project, covering a territory extending from Sacramento to Salt Lake City. The companies, which, it is said, may be purchased, are the Truckee River General Electric Company, with two hydro-electric plants near Floriston, Cal., transmitting to Virginia City, Nev., and the American River Electric Company, which has a plant near Placerville, transmitting to Stockton and elsewhere.

A. L. Bearkey, representing the Las Cruces Electric Light and Ice Company of Las Cruces, N. M., has presented a request to the Council for franchise to use streets and alleys of the town for 25 years. The franchise is for lighting, gas, waterworks and an electric-car line.

W. H. Mangold of Milton has been in Walla Walla, Wash., organizing a company for the purpose of irrigating 2,500 acres of land near Monument. A dam of masonry 250 feet long and 80 feet high will be built. An electric power plant generating 1,000 horsepower is to be installed. The company will supply Monument and the surrounding towns with light. A sawmill is also to be erected. All water rights have been secured.

The new $400,000 Young Men's Christian Association Building, which is to be erected in San Francisco, will have its own 450-kilowatt electric power plant in the basement. A.

PERSONAL

Mr. E. D. Nimms, president of the Pioneer Telephone and Telegraph Company of Oklahoma City, Okla., left last week for an extended tour of Europe.

Dr. Henry S. Carhart, professor of physics at the University of Michigan, is in New York, delivering a course of lectures in the summer session of Columbia University.

Mr. V. R. Lansingh of New York, general manager of the Holophane Company, sailed for Europe on July 25th, to be gone for six weeks. He will spend the greater part of this time in studying recent European developments in the science of illumination.

President R. B. Benjamin of the Benjamin Electric Manufacturing Company, Chicago, has gone to London for the purpose of establishing a branch office and factory for manufacturing and handling the company's wireless clusters and lighting specialties abroad. He is accompanied by Mr. B. J. Grigsby of the engineering department, who will be left in charge upon Mr. Benjamin's return. A stay of from four to five weeks is contemplated.

Mr. H. C. Eddy, superintendent of the Electrical Department of the District of Columbia government, has been elected executive officer and secretary of the new Electric Railway Commission, at a salary of $2,500. The Interstate Commerce Commission has confirmed the selection. Mr. Eddy has been an electrical engineer for 16 years, has spent 10 years of that time in the construction and operation of electric railroads, and has been in Washington about 10 years, working for the various electric roads and for the District government.

Major Zalinski, U. S. A., retired, has assumed the presidency of the Bureau of Illuminating Engineering of New York city. Major Zalinski, who is naturally of a scientific mind, devoted a great number of years to military research, particularly that relating to artillery. He is perhaps best known to those interested in illumination by the results that have been obtained from the diffusing reflector which he perfected. He has also contributed to the press various articles relating to the advancement of the science and art of illuminating engineering. In these he paid particular attention to the diffusion of artificial light.

ELECTRIC LIGHTING

Sidney, Iowa, is to issue bonds for an electric-light plant.

With the desire that Baker City, Ore., should hold the reputation for being the best lighted town of its size, local business men have raised a fund to secure the continuation of more than 1,000 incandescent lamps on the main street.

The City Council of Pipestone, Miss., is considering the installing of a municipal electric-light plant.

The Wynoka (Okla.) Electric Light and Power Company will install an electric-light plant.

Keokuk, Iowa, has granted Hugh L. Cooper franchises to operate a street railway and an electric-lighting plant in that city.

The municipal plant at Escanaba, Mich., was to begin furnishing power August 1st. The machinery has been installed complete for some weeks.

In Bridgeport, Conn., after trouble had been reported from the clogging of the sewers which continued to overflow in spite of frequent cleanings, an inspector discovered that in several places the poles of the electric-light company had been set directly through the sewers by careless workmen.

A merger of the People's Light, Heat and Power Company with the Home Light, Heat and Power Company, the capital stock of the new combined company to be $1,000,000, was announced following a meeting of the directors of the companies at Springfield, Ohio, on July 23d. Outside capital is interested in the consolidated company.

Lakewood, a suburb of Cleveland, Ohio, is proposing to give the Cuyahoga Light Company a franchise to furnish electricity at about two-thirds the prices charged by the Cleveland Electric Illuminating Company, which already has a contract for 10 years to furnish the streets lights. The newly favored company would erect a separate plant at Lakewood, and a lighting war seems imminent.

It is understood that an arrangement has been perfected whereby the People's Light, Heat and Power Company and the Home Lighting, Power and Heating Company, both of Springfield, Ohio, will be consolidated and taken over by a new company with a capital of $1,000,000. Several New York and Boston electrical men will be identified with the new concern. John L. Zimmerman is president of the People's company, and E. S. Kelly is president of the Home company.

ELECTRIC RAILWAYS

Extensive improvements to its power plant at Winona, Minn., now being made by the local street railway and lighting company, will cost $65,000. This company was among the first in the Northwest to install steam turbines.

The extension of the Milwaukee Electric Railway and Light Company from Oconomowoc to Watertown, Wis., a distance of 13 miles, will soon be opened for traffic. The line ultimately will reach Madison, Janesville and other towns in that part of the state. A through-train service between Milwaukee and Watertown will be established.

According to statements of Frank M. Ohl of Toledo, president of the company, cars will be running on the interurban line now building between Marion, Ohio, and Upper Sandusky, by the first of the year. Two or three small gaps remain to be filled, when the Hocking Valley will be paralleled by trolley the entire distance from Toledo to Columbus.

The survey for the Columbus and Cooke City electric railway, between Absarokee and Columbus, Mont., has been completed. Cooke City is near Yellowstone Park, and the region is recognized as being one of the richest mining camps in the country. George H. Savage, who has been active in the promotion of the work, announced that ample funds have been secured to carry out the construction.

In the United States Circuit Court at Chicago Elbert Robinson, a negro physician, has attempted to secure $100,000,000 damages from the Chicago Railways Company, asserting that he is the inventor of the frogs and crossings used by the company. He has submitted a long bill of complaint and prays that the infringing devices be torn out and broken up.

The recent approval of the operating agreement between the Calumet and South Chicago Railway Company and the Chicago City Railway Company has permitted the latter company to take active charge of the Calumet and South Chicago system, including the Hammond, Whiting and East Chicago Electric Railway. The Chicago City company will operate and rehabilitate the entire system, keeping separate books, so as to keep exact record of the income and expenses of these lines distinct from its own, although the same departments will do the work on both systems. Features connected with the new operation are installation of a zone system of transfers and rebuilding of the track and overhead equipment and rolling stock in accordance with the new Calumet and South Chicago franchise, supply of power by the Commonwealth Edison and the North Shore Electric companies, and division of the net gain in operation into three-fourths to the Chicago City company and one-fourth to the Calumet and South Chicago company.

The report is revived that the line between Cœur d'Alene and Wallace, Idaho, will be built and the Hayden Lake line will be built this year as far as Squaw Bay on Pend Oreille Lake. The junction of the two roads will be at Cœur d'Alene. The new roads will be branches of the Inland system, and under the same control. It is rumored that the shops of the system are to be located at or near Cœur d'Alene. Several months ago M. D. Wright purchased 20 acres which are said to be intended for this purpose.

Directors of the Winona Interurban Railway Company are considering the construction of various spur lines and the granting of Sunday service on the lines of the company. Winona Park, Ind., is a religious assembly ground, and the Sunday rule has been observed strictly in connection with the railroad, which is under the same management. The Sunday-service matter is one of much importance. A receivership suit against the road, now pending, has grown out of the refusal to give Sunday service.

A new seamless trolley pole is manufactured by the R. D. Nuttall Company, Pittsburg, Pa. It is made of cold-drawn seamless tubing reinforced at the bottom and with a gradual taper at the top. The reinforcement is 16½ inches long and made of the same material as the pole proper. It is inserted cold and with such care as to fit that it practically becomes a part of the pole. The taper begins three feet from the top and reduces the diameter from 1½ inches at this point to one inch at the end. The pole is made in all lengths up to 18 feet and combines rigidity with light weight. The average weight of the 12-foot poles is 22 pounds.

POWER TRANSMISSION

The historic Tippecanoe River will be utilized for a power development. Excavating for the power house is under way, and the promoters expect to cut the prices of electricity supplied to Logansport, Ind.

Now that a franchise has been granted to the Fremont Power and Light Company, work will be started at once on the power house at Ballville, just south of Fremont, Ohio. The company proposes to "harness" the Sandusky River and secure its power from this source.

The Empire Water and Motor Company means to expend about a million dollars in erecting hydraulic power plants at Green Mountain Falls, Cascade and Manitou, generating electricity for use in the region of Pike's Peak. Colorado Springs, Colo., may later be supplied with power from this company.

In order to hasten the work on the McCall's Ferry power plant, 300 additional men have been put to work. This force will hurry the work on the tailrace, to permit the water to be turned in through the locks on the Lancaster County side and allow the contractors to complete the work on the York County side of the river.

The Stone & Webster engineering corporation has been awarded the contract for the construction of a 20,000-horsepower dam for the Helena Power Transmission Company at Hauser Lake, Mont. The corporation will also design and construct a plant of 30,000 horsepower at Wolf Creek, a few miles above Hauser Lake. These developments will furnish power by high-tension transmission lines to Helena and Butte, largely for mining purposes. It is estimated that the cost of the two projects will be $3,000,000.

The third power plant, to be constructed by the Utah County Light and Power Company, will be built in Alpine Canyon, about six or eight miles from American Fork. The other two plants of the Utah County Light and Power Company are located in American Fork Canyon. Construction work on the second plant has hardly been completed, but the demand for electrical power has been so great within the last few years that the backers of this company deem it wise to build a third plant. Two sites have been suggested in Alpine Canyon for the third plant, but the matter of selecting the site will be held pending a report from Professor Lyman of the University of Utah, who has charge of the survey.

TELEPHONE

The North Platte and Dickens (Neb.) Telephone Company has been incorporated with a capital stock of $5,000.

The Northwestern Mutual Telephone Company of Crofton, Neb., has been incorporated with a capital of $5,000.

The Pioneer Telephone Company of Oklahoma City, Okla., has been organized with a capital stock of $25,000. The directors are W. A. Lovejoy, E.

P. Spears and N. S. Shercan, all of Oklahoma City.

At Hollis, Okla., the Hollis-McKnight Telephone Company has been incorporated for $3,500 by J. B. Moore, R. H. Holland and T. J. Stewart.

The Chicago Telephone Company will take over the Zion City telephone system, which heretofore has been a private concern, the franchise being in Dowie's name.

Twenty armed night riders near Gracey, Ky., captured the telephone exchange and burned the building. The town is in the tobacco district, where other outrages have been committed.

The net earnings of the American Telephone and Telegraph Company for the six months ended June 30, 1908, were $12,714,621, an increase of $2,178,418, or 20.6 per cent. over the corresponding period last year.

From Oklahoma City, Okla., long-distance connection has been made between the Pioneer Telephone and Telegraph Company and Colorado points over the lines of the American Telephone and Telegraph Company.

The Hackberry Telephone Company of Peek, Okla., has been incorporated with a capital stock of $5,000 by D. M. Davis, D. E. Glaney and J. C. Pierce of Arnett and H. M. Conner of Peek, and S. T. Lawrence of Reason.

An American consul in a South American country reports that there is a movement on foot to form another telephone company in that region, and the promoter of the new company wishes to communicate with manufacturers in the United States regarding a complete installation. An automatic switchboard and about 800 instruments will be needed. Full information is requested as to the cost of sending a superintendent of construction to erect the plant and to operate the system. The address can be obtained on application to file No. 2453, Bureau of Manufactures, Washington, D. C.

PUBLICATIONS

A souvenir advance post card in colors, showing the Bissell Frog "fishing for orders," will be sent to anyone on request by the F. Bissell Company, dealer in wholesale electrical supplies and machinery, Toledo, Ohio.

The University of Illinois has issued a compact circular of information regarding the College of Engineering at Urbana. The booklet contains a description of equipment and the announcement of the courses for the coming college term.

Bulletin No. 4600, recently issued by the General Electric Company, Schenectady, N. Y., describes various types of controllers for use in connection with both alternating and direct-current motors, on electric cars, locomotives, automobiles, launches, elevators, trains, hoists, etc., and also in rolling mills, machine shops, printing plants and pumping stations. The bulletin describes the controller most suitable for a specific purpose, and contains general data and dimensions which will be found of value to anyone contemplating the installation of motor drive.

A handsomely illustrated booklet descriptive of the Thury automatic regulator will be sent to anyone interested on application to the Ateliers H. Cuénod, of Geneva, Switzerland. Though written in French, numerous and clear drawings and reproductions of photographs will aid the reader not familiar with that language to interpret the description and operation of the Thury regulator in its many applications to the control of direct and alternating-current generators and accumulators, and the regulation of parallel-operated machines, three-wire systems, feeders, etc.

The General Electric Company, Schenectady, N. Y., describes in a bulletin recently issued an arc lamp specially suited to the illumination of mills and factories, where the vibration caused by machinery and the variation in line voltage resulting from the use of motors for machine drive render the ordinary arc lamp unsatisfactory. The lamp described is of the multiple type, and is for use on 220-volt direct-current circuit. In the design of this lamp special attention has been paid to the insulation of the binding posts and the hanger in order to render practically impossible the grounding of the lamp as a result of the accumulation of dust on the top. This lamp is described in detail in bulletin No. 4603.

The Central Electric Company of Chicago, Ill., is distributing a folder describing its new "thermostatic magnet protector," designed automatically to open the circuit when the temperature of magnet coils in arc lamps or other devices has reached a dangerous temperature. The device is also applicable for use as a fire alarm or detector of heat on bearings on circuit with a signal system. The circular includes an exhaustive report by the Commonwealth Edison Company's laboratory. The Central Electric Company is also sending out its new meter book, describing a new and improved type of commutating form of integrating wattmeters for direct and alternating current. Particular attention is called to the fact that the armature is of the open-coil type, having but three coils symmetrically arranged on a shaft and connected to a three-point commutator. The meter employs but one series coil, so located that the armature can be taken out without disturbing other parts. This new meter book will be mailed to any address upon request.

SOCIETIES AND SCHOOLS

The executive board, which has been in session at Springfield, Ill., has called a special meeting of the International Brotherhood of Electrical Workers to be held in St. Louis, September 15th. Several new officers will be elected.

Mr. William D. Ray, contract agent for the Sanitary District of Chicago, will address the Electric Club of Chicago some time during August. Although the exact subject has not been announced, the address will relate to the disposal of the electric current generated by the Drainage Canal plant at Lockport, Ill.

The Highland Park College of Engineering, Des Moines, Iowa, which offers regular courses in civil, electrical and mechanical engineering, holds sessions 48 weeks in the year, so that it is possible to complete the four-year course in three school years. Work of more strictly practical nature is that given in such short courses as the one year's course in electrical and steam engineering, and mechanical drawing. The short course in traction, gas and oil engineering may be completed in three months. Little class work is offered in these subjects. The one-year machinist's course enjoys the distinction of machine shops as complete as those of any engineering school.

MISCELLANEOUS

The fittings, the "cold motors," the office fixtures and the plant itself of the factory recently operated by Charles F. and Benson Bidwell, who were convicted on charges of swindling several weeks ago, were all sold at auction in Chicago recently by order of the United States court. The sale realized about $25,000.

Writing to the London Times, Sir Oliver Lodge points out the danger of breathing air artificially charged with ozone. While this substance is an excellent disinfectant, and perfectly harmless when present in natural quantities, it may cause very injurious effects if inhaled in excess, and Sir Oliver quotes a painful experience of his own in support of this statement.

A newspaper dispatch from San Diego, Cal., July 24th, announces that the operator at Point Loma while idly signaling, suddenly picked up messages which proved to come from the battleship Connecticut of Admiral Sperry's fleet, then 2,900 miles distant and bound for Auckland, New Zealand, from Honolulu. Messages of identification were exchanged, but communication was soon lost, due to atmospheric conditions.

Electrical haulage on the Teltow Canal in Germany has made possible a wholesale but illegitimate method of catching fish. A tap off the trolley wire has only to be dropped into the water, someone has discovered, with the immediate result that all the fish within a radius of 10 yards are stupefied, and can easily be caught with hand nets. It is believed that this business had been carried on so extensively before it was detected that the fishery of the canal has been seriously injured.

A recent bulletin of the Indiana Railroad Commission shows that for the year ended June 30, 1908, there were 93 deaths of passengers from railroad accidents in that state. Of these 23 occurred on electric roads. Thirteen out of 175 trespassers killed on rights-of-way met their death by electric cars. Though 110 employes were killed, electric roads lost only five men in this way. An examination of the fatalities by quarters is very encouraging and presents a record of diminishing numbers, until the last quarter shows no deaths to passengers on either steam or electric roads.

The fourth annual convention of the sales, engineering and manufacturing departments of the Holophane Company was held at Hotel Sagamore, Lake George, N. Y., July 12th to the 18th. The party consisted of some 40 salesmen, department heads and executive officers, in addition to whom were the wives of half-dozen of the men and several invited guests, making a party of over 50. Conferences on matters of business and policy occupied the mornings, the men engaging in sports and pleasure jaunts in the afternoons. A number of important matters were discussed and plans adopted which will greatly enlarge the scope of the Holophane Company's work in future. Announcements of these changes will be made soon.

TRADE NEWS

The Chicago office of the General Compressed Air and Vacuum Machinery Company, in charge of District Manager W. H. Butler, is at Suite 815, 135 Adams Street.

The Central Electric Company of 224 South Jefferson Avenue, Peoria, announces the opening of a studio in its store, where it will show new and artistic effects in lighting fixtures.

The United Telephone Company, a sub-licensee of the Central Union Telephone Company, operating in the principal cities of the gas belt in Indiana, is in the market for material for the construction of a toll line from Huntington, Ind., through Mount Etna to Marion.

In the controversy waged since last fall between the George Cutter Company of South Bend, Ind., and the Ajax Line Material Company of Chicago respecting the trademark "Ajax," the examiner of interferences announces under date of July 10th that "it is adjudged that the Ajax Line Material Company is the owner of the trademark and entitled to the registration."

The Bureau of Illuminating Engineering, 437 Fifth Avenue, New York city, is prepared to undertake any problems pertaining to the use of artificial light, and has at its command practical as well as scientific facilities, for solving the most intricate propositions. It offers independent and unprejudiced advice to architects and general users of artificial light.

Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until August 18th, for the installation of a conduit and wiring system in the United States postoffice and courthouse at Green Bay, Wis. Drawings and specifications may be obtained from the above office or from German & Lignell, architects, Duluth, Minn.

The copper market still continues rather quiet with prices for electrolytic and Lake copper ranging from 12¾ to 13⅛ cents a pound. There has been some increase in buying orders for copper, and this, with brighter trade prospects, has given the market a little firmer tone. The good effect to be gained by encouraging home consumers to add to their stock on the basis of present low values would doubtless have the direct tendency to enlist the rank and file of the consuming interests as strong allies in creating more favorable conditions.

Dixon & Smith, consulting engineers, have opened an office at 818-820 Wright Building, St. Louis, Mo., where they will conduct a general engineering business. Will M. Dixon of the new firm has been prominently connected with the electrical departments of the Pan-American, Louisiana-Purchase and Jamestown expositions. Howard F. Smith, formerly with the New York Heat, Light and Power Company, was mechanical engineer at the St. Louis Exposition and has lately been associated with H. H. Humphrey, the well-known consulting engineer of St. Louis.

An American consular officer in a European country reports that the mayor of one of the principal cities in his district has published in the local papers an offer of a concession for the construction and exploitation of a tramway system for the city. Bids will be received up to October 14, 1908, and must be accompanied by a surety of $1,000. For further direct information, correspondence should be addressed in French or German to the official, whose name can be had on applying to file No. 2446, Bureau of Manufactures, Washington, D. C.

It may not be generally known that Holophane globes were first brought out in Belgium, England and France, and that the American company was in the beginning looked upon as a precarious enterprise. The Yankee glassmaker, however, is far in advance of the foreign artisan. Globes produced in America are far superior in every way to those of European manufacture and are also cheaper, so that the American company, of which Mr. V. R. Lansingh is the general manager, is today the more successful, both technically and commercially. It is expected that certain of the styles developed abroad will be acceptable to this market, and it is to arrange for an interchange of ideas and experience that Mr. Lansingh is at present making the European journey mentioned elsewhere.

BUSINESS

The Compania de Transvias Luz y Fuerza de Guadalajara, S. A., which is the result of the combination of the two former electrical companies of that city, and operates not only the entire lighting system, but also the railway system of Guadalajara, has en route to Mexico a large order for additional electrical machinery which was bought from Messrs. G. & O. Braniff & Co. of Mexico City. In order to meet the increasing demand for electrical power in Guadalajara, this company, finding that its power generating stations at La Junta and Juanacatlan were insufficient, found its necessary to purchase a 750-kilovolt-ampere Westinghouse three-phase belted-type generator, which will be installed at Juanacatlan. This new generator is but one of the four which will be installed as needed. The Westinghouse Electric and Manufacturing Company of Pittsburg is supplying the new electrical machinery.

F. B. Badt, president, and Paul A. Westburg, secretary of F. B. Badt & Co., Chicago, were present at the recent convention of the National Electrical Contractors' Association in Chicago, representing the interests of the Weston Electrical Instrument Company and of the Ward Leonard Electric Company. Professor Badt met many of his old acquaintances, members of the contractors' association.

The Minneapolis Steel and Machinery Company has just started work on another 300-horsepower Muenzel producer-gas engine and gas producer for the Aberdeen Light and Power Company, Aberdeen, S. D. The Aberdeen company already has a 300-horsepower Muenzel plant, which has been in operation since spring, and it is now adding another unit to take care of the increasing load. It is also of interest to note that the Hoopeston Gas and Electric Company, Hoopeston, Ill., recently added to its plant a 280-horsepower Muenzel producer-gas plant. This plant has now been in operation for a number of weeks, and is giving very good satisfaction.

In the recent equipment of manufacturing plants one of the most interesting features has been the introduction of Allis-Chalmers steam turbines into a great variety of industries, from factories of different kinds, where about the same quantity of power is used continuously during the day, to cement plants, steel mills, smelters, etc., where the load fluctuates violently from one moment to another. Flour-mill and saw-mill operators were among the latest to join the procession of turbine users, and now a tannery—one of the largest in the world—the Pfister & Vogel Leather Company, has just ordered two Allis-Chalmers turbine units, each of 1,500 kilowatts capacity, for the new plant to be built in Milwaukee. Another unit of the same size has been purchased by the Pueblo and Suburban Traction and Lighting Company, Pueblo, Colo., and the city of Holland, Mich., will install one of 750-horsepower capacity.

The General Electric Company announces that the following orders for new apparatus have been received recently: Isthmian Canal Commission, six 2,200-volt Curtis turbine units of 1,500 kilowatts each, with individual base condensers, electrical equipment for one 20-ton traveling crane, four 35-kilowatt exciters, four 500-kilowatt, 600-volt rotary converters, fifteen air-blast transformers, two switchboard equipments; Mitsui & Co., Japan, 50 railway-motor equipments with rotary converters, transformers, etc., 20 double-motor equipments with headlights and spare parts, three 1,000-kilowatt alternators; Australian General Electric Company, 70 four-motor control equipments for railway motors; Santos Dock Company, Brazil, six 3,000-kilowatt transformers and five 50-light constant-current transformers, one motor-generator set, 628 arc lamps, one switchboard, miscellaneous small motors and transformers; Pueblo Tramway, Light and Power Company, Mexico, 10 water-cooled 1,500-kilowatt, 60-cycle transformers.

The squealing commutator is a source of much annoyance, even though it may be entirely free from sparking and arcing. The Joseph Dixon Crucible Company of Jersey City, N. J., reports that its graphite brushes, which are made in only one quality, are giving most excellent satisfaction. The company frankly acknowledges in its literature that a one-quality brush is not adapted to all conditions, but does say that where its brushes are adapted they give an unexcelled service. The use of these brushes results in the commutator's taking on in a short time a highly polished surface, smooth and well rounded. The Dixon company remarks that since the installation of its own electric plant, some eight years ago, it has not had occasion to turn down its commutators, and, reasonably enough, it attributes the condition of the commutators to the use of its graphite brushes. A concise little booklet of 12 pages is supplied to all who may be interested in commutation and who will write to the Dixon company for it. Some incidental hints given in this booklet include information concerning the testing of brush pressure, and the filing of mica insulation. There are also some conclusions given as a result of tests made by Prof. Albert F. Ganz of Stevens Institute.

Within a month the Massachusetts Chemical Company of Walpole, Mass., has entered into contract with one of the great insulated wire and cable manufacturers to supply its entire requirements of cable cloth. The wire and cable concern in question has for many years made its own cable cloth, but has been convinced that by delegating this work to the Massachusetts Chemical Company, whose exclusive specialty is insulating compounds and the impregnating of fabrics with them, it will get not only a better and more uniform product, but get it at a lower cost than that at which it has been producing it itself.

DATES AHEAD.

Michigan Electric Association (annual meeting), Grand Rapids, Mich., August 18th to 21st.

International Association of Municipal Electricians (annual convention), Detroit, Mich., August 19th, 20th, 21st.

Ohio Electric Light Association (annual convention), Hotel Victory, Put-in-Bay Island, August 25th, 26th and 27th.

Old Time Telegraphers' Association and Society of the United States Military Telegraph Corps (annual reunion), Cataract-International Hotel, September 16th to 18th.

Colorado Electric Light, Power and Railway Association (annual convention), Glenwood Springs, Colo., September 16th, 17th and 18th.

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

Chicago Electrical Show (fourth annual), Coliseum, January 11 to 23, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) July 21, 1908

893,606. Magnetic Separator. Charles G. Buchanan, Brooklyn, N. Y. Application filed April 5, 1906.

Combined with a conveyor is a magnet having an annular core with radial pole pieces and peripherally wound coils on the core, the pole pieces being in contact during a portion of their extent to short-circuit the flux.

893,612. Track Instrument for Railway Signals. John F. Dineen, Geelong, Victoria, Australia. Application filed August 8, 1906.

A lever has separate arms set in frictional contact on a spindle, the short arm being arranged to engage with the rail of the permanent way, and the long arm being arranged to make and break an electric circuit.

893,618. Electric Transformer Furnace. Otto Frick, Stockholm, Sweden. Application filed November 16, 1905.

This furnace is provided with a stationary masonry chamber forming a melting space; a cover for closing this space, and rollers supporting the cover in such a manner as to allow it of being rotated about a central axis.

893,681. Dynamo-electric Machine. William L Waters, Milwaukee, Wis., assignor to the National Brake and Electric Company, Milwaukee, Wis. Application filed December 13, 1906.

A casing for a dynamo is composed of two sections adapted to be secured together, the line of separation between the two parts being along two vertical and three horizontal planes.

893,688. Rotary Snap Switch. Herbert C. Williamson, New York, N. Y. Application filed May 18, 1906.

This switch contains a ratchet, a spindle, a contact-actuating plate, a releasing cam, a pawl and a spring.

893,701. Machine for Extruding Metals. George H. Benjamin, New York, N. Y., assignor to the Coe Brass Manufacturing Company. Application filed June 9, 1906.

Connections lead to the die and to the plunger so as to provide for the passage of an electric current from end to end through the billet for heating it during the action of extrusion.

893,711. Field Magnet for Dynamo-electric Machines. Abe L. Cushman, Concord, N. H. Application filed May 8, 1905.

The field has laminated pole pieces provided with removable flaring pole tips, the ends of the pole pieces and the flaring pole tips being so formed as to provide substantially V-shaped lateral notches therebetween to concentrate the lines of force.

893,730. Railroad-switch Signal. William H. Harris, Stark, Mont. Application filed December 16, 1907.

A circuit containing signals has a knife switch actuated by a bell-crank lever and rod connected with the device for operating the railroad switch.

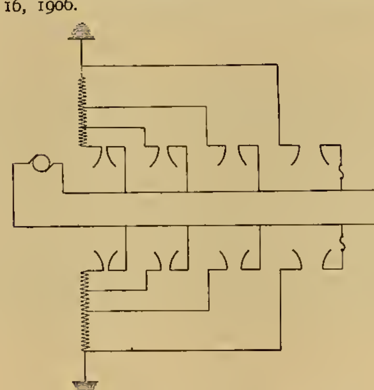
893,731. Electric Signal for Railways. William H. Harris, Stark, Mont. Application filed January 6, 1908.

The track rails are divided into block sections and into short sections at each end of each block section, each of the block sections being in circuit with one of the short sections at the far end of the succeeding block and also in circuit with one of the short sections at the far end of the preceding block.

893,733. Automatic Apparatus for Supplying Air for Many Purposes. William Hooker, South Melbourne, Victoria, Australia. Application filed March 18, 1908.

An electrically operated bellows is provided with an air tank having a movable bell, which automatically actuates a switch for closing and opening the motor circuit.

893,742. Lightning Arrester. Ralph D. Mershon, New York, N. Y., assignor to the Westinghouse Electric and Manufacturing Company. Application filed September 27, 1904. Renewed July 16, 1906.



No. 893,742.—LIGHTNING ARRESTER

A multi-gap arrester comprises a series of grounded discharge paths spaced apart and connected to the line conductor in multiple and severally provided with discharge gaps of successively higher striking potentials and with successively lower resistances between the gaps and the ground. (See cut.)

893,757. Switching Indicator. Warren L. Sullivan, Newark, N. J., assignor of one-half to Robert L. Hatfield, Newark, N. J. Application filed October 3, 1907.

This indicator for showing the destination of a train as it approaches a switch is provided with unitary signaling devices, one for each of the branch tracks, having each an indicator dial with a series of index marks thereon, a magnet with an electric circuit, and contact operable at the inlet end of the railway section, and a similar magnet operable upon one of the branches, and mechanism connected with the two magnets for turning the dial step by step in reverse directions.

893,783. Electric Heater for Shoe Operatives' Knives. Edwin N. Chandler, Brockton, Mass., assignor to the Simplex Electric Heating Company, Boston, Mass. Application filed April 16, 1908.

A flat-top table has a yielding plate clamped against its top to receive beneath it the blade of a knife and hold the same down flat directly against the heating surface of the table, which is equipped with electric-heating means for maintaining it hot.

893,802. Safety Apparatus for Elevators. Charles W. Hoffman, New York, N. Y. Application filed August 22, 1907.

A spring-actuated control switch in the main-controller circuit is normally held closed by a flier.

893,811. Electrical Condenser. Greenleaf W. Pickard, Amesbury, Mass. Application filed November 5, 1907.

The condenser comprises a glass base, a binder on the base and having a finely powdered conductor admixed with it, and an electrolytic deposit of a conducting coating combined with the conducting constituent of the binder.

893,814. Device for Producing Electrolytic Metal-plating. Albert Schmitz, Brussels, Belgium. Application filed March 12, 1906.

A device adapted for plating continuous objects has a disk-shaped current collector arranged in a vertical plane and provided with a laterally concave-grooved flange contacting with one side of one of the objects to be plated, and double-flanged guide-rollers keeping the disk-shaped current collector in contact with one of the objects to be plated.

893,816. Starting Device for Mercury-vapor Apparatus. George Schwarz and Josef Amon, New York, N. Y. Application filed March 26, 1906.

The starting device is in a branch circuit and consists of a movable contact, a thermal controlling device and means for opening the branch circuit and establishing the main circuit.

893,820. Intercommunicating Telephones. Henry C. Thomson, Boston, Mass., assignor to the Electric Goods Manufacturing Company, Boston, Mass. Application filed March 20, 1907.

Each telephone is equipped with metallic terminal plates corresponding to the number of other stations, and a connecting cable containing corresponding wires, as well as a common return talking and ringing battery wires.

893,822. Contact Breaker. Gustav A. Unterberg, Karlsruhe-Mühlburg, Germany. Application filed April 16, 1907.

A contact-breaking device for igniters consists of a stationary and a movable member, means for operating the latter periodically, and a detachable cap in which the two contact-breaking and making members are mounted.

893,835. Field Magnet for Dynamo-electric Machines. Abe L. Cushman, Concord, N. H. Application filed March 18, 1907.

This is a modification of No. 893,711, in which each pole has a longitudinal recess or pocket into which fits a removable section of the pole piece. (See cut.)

893,857. Flexible Conduit. George A. Lutz, New York, N. Y., and Clarence C. Sibley, Perth Amboy, N. J., assignors to the American Circular Loom Company, Portland, Me. Application filed April 3, 1906.

A conduit for electric wires comprises a covering, and a spirally wound strip of insulating material provided with series of rows of perforations at distances apart and extending at an angle to the longitudinal axis of the conduit.

893,865. Telltale Apparatus for Running Machinery. Harry O. Ormiston, Kogarah, and William D. Martin, Ashfield, New South Wales, Australia. Application filed August 10, 1907.

A warning appliance consists of a lower ebonite block with projecting metallic contact points, an upper ebonite block with projecting metallic contact points, a spring to keep the contact points apart, and a bell circuit.

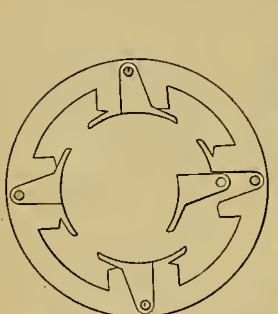
893,873. Incandescent-lamp Socket. William F. Ritter, Cincinnati, Ohio. Application filed May 13, 1907.

The dome cap of a pendent socket has an interior insulator lining, with a transverse central partition and a perforation at either side of the partition. Each of the lamp cords passes through one of the perforations in the lining and has a single knot made therein.

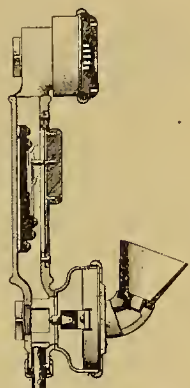
893,880. Swivel Joint for Electric Currents. Augustus B. Smith, Wilkinsburg, Pa. Application filed March 22, 1906. Renewed May 1, 1907.

A swivel joint comprises a stationary base provided with current-supplying terminals, a rotatable portion provided with current-consuming terminals, and intervening unattached rolling-current transmitting devices.

893,891. Hand Telephone Set. George F. Atwood, East Orange, N. J., assignor to the Western Electric Company, Chicago, Ill. Application filed March 12, 1906.



No. 893,835.—FIELD MAGNET



No. 893,891.—HAND TELEPHONE SET

A hollow handle carries a receiver and transmitter and has a conductor-carrying cord passing through a hole, and a stuffing box for holding the cord to prevent strain on its terminals within the handle, and for sealing the hole. (See cut.)

893,898. Illuminating Device for Bake Ovens. Christian N. Bergmann, Pittsburg, Pa., assignor to the Ward-Mackey Company, Pittsburg, Pa. Application filed December 14, 1907.

An incandescent lamp in the interior of the oven is provided with a switch operated by the opening and closing of the oven door.

893,902. Electrical Permutation Lock System. Henry T. Cleary, St. Louis, Mo. Application filed April 10, 1908.

An electrically released lock is governed by electromagnets that co-operate with a number of circuits, each containing a circuit-closer and terminating in a permutation switch.

893,918. Thermostat. William F. Gossick and Arthur R. Van Valkenburgh, Chicago, Ill. Application filed July 18, 1907.

The thermostat consists of two parts, one of which is adapted to be applied to the device to be protected and the other of which is readily removable therefrom. A heat-operated circuit-closer is carried by the removable part.

893,936. Electric Regulation. Morris Moskowitz, New York, N. Y., assignor to the United States Light and Heating Company, New York, N. Y. Application filed April 2, 1906.

This is a regulator for a storage battery and consists of a compound-wound electromagnet operating a switch, and an adjustable rheostat in the work circuit.

893,939. Head for Insulating Machines. Vernon Royle, Paterson, N. J. Application filed December 30, 1904.

The insulating head is provided with a die and hollow core, a guide pulley adjustably supported at the base of the core, and a screw for adjusting the pulley.

893,953. Telephone Relay. Charles W. Underwood, Crowley, La. Application filed February 6, 1908.

In this relay there are two receiver magnets electrically connected in series, a transmitter, an armature in operative relation to each magnet and mechanically connected to the transmitter on the side thereof remote from the armature, and filamentary supports for each armature having a localized central connection thereto.

893,955. Spark Plug. Clarence T. Van Woert, New York, N. Y. Application filed August 1, 1907.

The plug has two vertically aligned electrodes, with a spark gap between them arranged to be kept free from oils or other liquids.

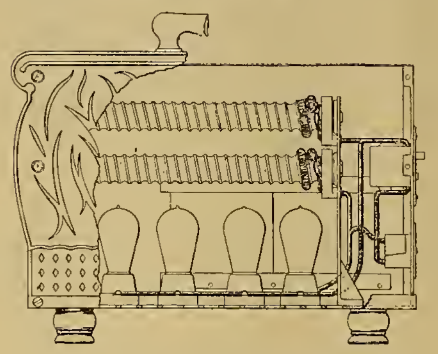
893,979. Dynamo-electric Machine. James Burke, Erie, Pa., assignor to the Burke Electric Company. Application filed February 4, 1907.

A multi-polar, direct-current generator has an auxiliary winding for maintaining a fixed potential, the winding being connected at one terminal to a point in the main armature winding and having its parts located in the magnetic field to correspond substantially with the phase location of the circuit of the main winding beginning at that point of the main winding.

893,993. Signaling Mechanism. Willard H. Gilman, Medford, Mass., assignor to the International Telemeter Company, Boston, Mass. Application filed April 25, 1907.

A signal-transmitting apparatus comprises a contact device, motor mechanism for operating it, and electromechanical means for first gradually checking the motor mechanism and then positively stopping it.

893,994. Illuminated Electric Heater. Francis C. Green, New York, N. Y., assignor to the Consolidated Car Heating Company, Albany, N. Y. Application filed November 30, 1907.



No. 893,994.—ELECTRIC RADIATOR

An illuminated electric radiator has a casing whose front is perforated to imitate a flaming fuel-bed and to permit the passage of air currents, and one or more electric lamps and bare-wire heating elements located in the casing. (See cut.)

893,997. Disturbance-operated Circuit-breaker. Leo D. Haas and Edwin G. Derbridge, San Jose, Cal. Application filed November 3, 1906.

On an insulating upright support are mounted two adjustable conducting brackets, to the upper one of which is pivoted an adjustable pendulum. When this is disturbed it closes a circuit through the lower bracket, which operates a relay so as to open a switch.

894,015. Generator. Keijiro Kishi and Matsutaro Nakamura, Tokyo, Japan. Application filed January 4, 1907.

On the shaft is a series of parallel plates, each of which forms a part of a number of poles and connecting yokes. A number of blocks has each a curved outer surface disposed adjacent each pole of the end plate of the series. A coil surrounds each of the poles and its terminal blocks.

894,032. Insulated Rail Joint. Anderw Morrison, Pittsburg, Pa. Application filed January 23, 1908.

An insulating strip is placed between each splice bar and each rail end and an insulating bushing around each bolt.

894,044. Electric Selective System. Frank D. Pearne, Chicago, Ill., assignor to M. E. Swart, Chicago, Ill. Application filed July 11, 1904.

The system has a transfer-switch mechanism acting electrically at the cessation of the impulses through the main conductor to shift its connection to the branch conductors in regular order, whereby the branches are automatically and successively connected to the main conductors in the same order as the impulses of the signals are received.

894,070. Extraction of Water or Other Liquid from Mineral, Vegetable and Animal Substances. Botho Schwerin, Höchst-on-the-Main, Germany, assignor to Farbwerke vorm. Meister Lucius & Brüning, Höchst-on-the-Main, Germany. Application filed June 27, 1905.

This process consists in causing the material to be treated by electro-osmosis to pass between the electrodes in such a manner as to avoid any mixing of the material.

894,142. Telegraph Transmitting Instrument. Frederick H. W. Higgins, London, England. Application filed December 12, 1905.

In a type-printing telegraph system in combination with a number of electrical circuits are intermittently moving means for carrying type in one of the circuits, printing means in another circuit, together with means for controlling the intermittently moving type means.

894,143. Perforating, Punching Machine, etc. Frederick H. W. Higgins, London, England. Original application filed December 12, 1905. Divided and this application filed October 15, 1906.

Associated with a number of key levers is a number of electrical contacts and electromagnetic punches, the depression of any key lever closing an invariable number of contacts and thereby operating an invariable number of punches.

894,144. Rotor for Dynamos and Electromotors. Jack Hissink, Berlin, Germany. Application filed May 17, 1906.

Groups of rotor conductors projecting from the ends of the rotor core are provided with separating rings radially projecting beyond the conductors and binding wires wound on the conductors between the projecting rims of the rings.

894,150. Lightning Arrester for Electrical Circuits. Ralph B. Ingram, Wilkinsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company. Application filed December 4, 1905.

This is a modification of the multi-gap arrester described in patent No. 893,742.

894,157. Process for Operating Electric Arc Lamps in Series. Frank M. Lewis, Brighton, England, assignor to the General Electric Company. Original application filed November 21, 1904. Divided and this application filed January 20, 1908.

The process consists in impressing a constant potential on the circuit and causing the arc length of each of the lamps in series to vary in unison from moment to moment to thereby gradually change the current flow.

894,158. Electric Arc Lamp. Frank M. Lewis, Brighton, England, assignor to the General Electric Company. Application filed November 21, 1904.

The lamp has a series-regulating coil only, and a coacting armature exerting a variable mechanical pull differing sufficiently in its several positions to generate a differential restoring force upon any armature of the group which may be out of position.

894,165. Telautograph. Foster Ritchie, Acton, England. Application filed April 27, 1908.

An electric generator is provided with stationary brushes and a set of brushes movable with relation to the commutator and to the stationary brushes. There are means operatively connecting the movable brushes with corresponding telautograph devices.

894,166. Means for Producing and Utilizing Rays of Light for Therapeutic Purposes. Corydon E. Rogers, Seattle, Wash., assignor to the Rogers Therapeutic Lamp Company, Phœnix, Ariz. Continuation of abandoned application filed February 16, 1903. This application filed March 7, 1905.

This therapeutic lamp is equipped with a combined hood and director, an incandescent lamp of great heat and light-giving power suspended in the hood, and a transverse reflector arranged about the lamp at a point between the extreme ends thereof.

894,167. Keyboard. Adolph H. F. Schaar, San Francisco, Cal., assignor to the United States Wireless Printing Telegraph Company, Los Angeles, Cal. Application filed July 13, 1906.

There are a number of pivoted transmitting key levers, each having a contact point at one end, a bar provided with a number of contact points, one for each of the levers, and means for closing an electrical circuit through either of the points when its key lever is actuated, and means for locking the levers when circuits are so closed.

894,170. Telephone Repeater System. Nathaniel G. Warth, Columbus, Ohio. Original application filed April 23, 1906. Divided and this application filed April 22, 1907.

A reciprocal telephone repeating system contains repeating relays, each inductively responsive to currents originated in its respective line section and unresponsive to currents produced by it in the other line section

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired July 28, 1908:

456,558. Electrode for Secondary Batteries. O. C. Flick, Brooklyn, N. Y.
456,593. Regulation for Dynamos Driven by Compressed Air. V. Popp, Paris, France.
456,598. Electric Arc Lamp. F. L. Sautter, Paris, France.
456,612. Electromotive-force Regulator. E. M. Bentley, Boston, Mass.
456,683. Attachment for Poles for Electric Wires. E. Verstraete, St. Louis, Mo.
456,684. Electric Gas Lighter. A. Wunderlich, Cleveland, Ohio.
456,685. Automatic-electric Gas Lighter. A. Wunderlich, Cleveland, Ohio.
456,718. Coin-controlled Electrical Apparatus. T. L. Brooks, Port Byron, N. Y.
456,803. Annunciator. Wm. C. Dillman, Brooklyn, N. Y.
456,804. Alternating-current Motor. M. Von Dolivo-Bobrowolsky, Berlin, Germany.
456,817. Electric Circuit-changing Apparatus. H. V. Hayes, Cambridge, Mass.
456,835. Electric Condenser Regulator. J. McBride, Brooklyn, N. Y.
456,836. Railway Signaling Device. W. Newcome, Johnsonville, N. Y.
456,843. Secondary Battery. H. Pieper, Liege, Belgium.
456,888. System of Electrical Distribution. M. Feilbogen, New York, N. Y.
456,889. Electric Circuit-breaker for Secondary Generators. M. Feilbogen, New York, N. Y.
456,908. Electric Hoisting Machine. G. H. Reynolds, New York, N. Y.
456,925. Armature for Motors and Generators. N. C. Bassett, Lynn, Mass.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, AUGUST 8, 1908 No. 6

MODERN CENTRAL-STATION SYSTEM OF GRAND FORKS

Grand Forks, N. D., possesses a new and well designed central-station plant embodying several features of interest. The station is owned by the Grand Forks Gas and Electric Company, and it supplies current to the city of Grand Forks and to the neighboring town of East Grand Forks, Minn., on the opposite bank of the Red River of the North. This river forms the dividing line between the states of North Dakota and Minnesota, and Grand Forks is a flourishing city of over 10,000 inhabitants, situated almost midway of the state on the eastern boundary.

The plant described in this article supplies both sides of the river at this point with direct current, besides transmitting a limited amount of alternating current to outlying districts. The power house is a new and model building erected in 1906 on the west shore of the Red River of the North. At present the plant has a total capacity of 660 kilowatts in direct-current units arranged on a 120-240-volt, three-wire system, and there is a 100-kilowatt motor-generator set capable of supplying alternating current at 2,300 volts.

Although a comparatively small installation, the station is worthy of attention because of the features of its modern and excellent design, unusual coal-handling apparatus and a transmission span over the Red River of the North, supplying the territory across the river.

Excavation for the building was begun in June, 1906, and on account of the difficulties encountered considerable time was required for making the foundations. In places the excavation had to be carried 20 feet below the basement level. At this depth large concrete piers were built up to the height of the basement floor at a distance of 15 feet from center to center. Concrete footings were then laid uniformly on the ground and on the piers, and reinforcing rods inserted in the concrete. The walls are of concrete to the bottom of the water-table, which is about two feet below the engine-room floor. The upper portion of the walls is of building brick laid in cement mortar.

Fig. 5 on page 95 is a reproduction of a photograph showing the exterior of the completed building as viewed from the front or street side.

Fig. 1. Interior of Engine Room of Station
Fig. 2. Transmission Span Across the Red River of the North
MODERN CENTRAL-STATION SYSTEM OF GRAND FORKS, N. D.

The entire work of construction and installation was finished and the plant was put in operation by January 1, 1907.

An idea of the general layout of the plant will be gained from an examination of the floor plan and sectional elevation reproduced in Figs. 3 and 4, showing the arrangement of the boilers, engines, generators, switchboard and motor-generator set. A turbo-generator set recently contracted for is shown in these drawings, but has not yet been installed.

The coal-handling apparatus, illustrated in Fig. 6, consists of a boom derrick of structural-steel construction, with a mast 70 feet high. The boom, 60 feet long, can swing in a complete circle of that radius. The coal or other fuel may be taken directly out of cars on the adjacent railroad tracks by means of a clam-shell bucket, and swung into storage on the ground or into a hopper and cars for immediate use.

Fig. 7 is a drawing of the details of this coal-handling apparatus, and the plan view gives an excellent idea of the arrangement of the various railroad, coal and ash tracks about the mast. There is no difficulty in storing 3,000 to 6,000 tons of coal on the ground within range of the bucket.

It will also be noted that within the radius of the boom there is an elevated hopper-shaped bin with a capacity of 50 tons. Coal cars run under this bin on a track having the same level as the boiler-room floor. The cars are loaded from the bin by opening the bottom valve. In this way the coal is transferred into the boiler room. Just inside of the door is a track scale on which the car may be weighed as it passes in. The track extends the full length of the boiler room, enabling coal to be delivered from the cars to any boiler.

The coal used is a mixture of Youghiogheny screenings and anthracite dust, which is not suitable for automatic stoking, so firing is done by hand. The fire grates are of the ordinary fish-bone pattern, with a one-quarter-inch air gap. Forced draft is supplied under the grate by a Sturtevant blower belted to a 50-horsepower Westinghouse compound engine for winter use when the demand on the boilers is heaviest. A 15-horsepower motor takes the place of this engine during the summer or periods of light load.

As shown in the floor plan, Fig. 3, there are four Stirling boilers installed, with provision for two future boilers at the right, one of which will be put in place at the time the new turbine is installed.

The flue gases from the boilers are led into a large brick passage immediately behind the boilers and conducted through a Green economizer on the way to the stack. The reinforced-concrete smokestack, built by the Weber Steel Concrete Chimney Company of Chicago, is nine feet in diameter and 175 feet high.

The boiler-room floor is nine feet higher than the basement floor, which is at the level of the ground at one end of the building. Along the basement floor, in front of the boilers, there is a second line of track which extends out to the ash pile at the rear. Ashes from the boilers may thus be dumped directly into cars and carried outside instead of being drawn out on the boiler-room floor.

All of the boilers are connected into a common header, from which separate leads supply each steam unit. Three reciprocating engines direct-connected to generators are now installed as follows:

24 by 34-inch Hamilton-Corliss engine, 420 kilowatts (Hoover, Owens & Rentschler Company, Hamilton, Ohio).

15 and 25 by 16-inch Ball tandem-compound engine, 160 kilowatts (Ball Engine Company, Erie, Pa.).

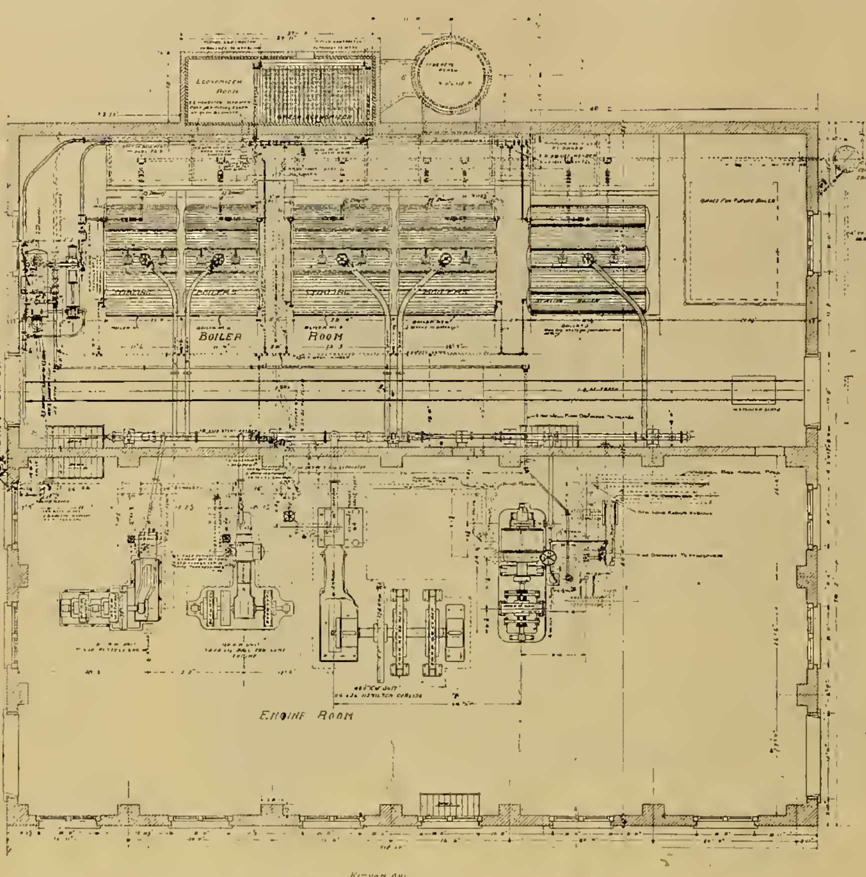


FIG. 3. PLAN OF BOILER AND ENGINE ROOMS OF CENTRAL STATION AT GRAND FORKS, N. D

13 by 18-inch Russell engine, 80 kilowatts (Russell Engine Works, Massillon, Ohio).

The working steam pressure is 150 pounds per square inch. The engines are commonly run non-condensing, and will operate on 10 pounds back-pressure when the exhaust steam is delivered to a district heating system which furnishes steam heat to the larger part of the city.

The steam-heating plant was originally installed by the American District Steam Company in 1900, and has since been added to to meet the demands of Grand Forks customers, until at the present time it covers practically all of the business district of the city.

No move by the company has yet been made toward the extension of heating service to the residence section, although this action may be decided upon some time in the future. This heating plant has shown a very steady and consistent growth since it was first put in service. The connected load and the gross income have increased to an amount equal, approximately, to 300 per cent. of the first year's business.

Steam-heating service is furnished entirely upon the basis of meter registration. One interesting feature in connection with the heating system which is not found in other district heating plants is the fact that heating service is furnished for the entire year instead of during the heating months, as is ordinarily the case. This is done, primarily, because of the many contracts which the company has for supplying steam for cooking purposes, heating water for domestic and other uses, and for such of its customers as require a certain amount of steam for mechanical purposes during the summer as well as the winter months. By slight modifications in the size of pipe, cooking with exhaust steam at about six pounds' pressure has been found very successful.

That the heating service of the company has been entirely satisfactory is shown by the fact that practically all of the original customers are still connected to the line. The company is furnishing service to some of the large business blocks and hotels, and to the government building as well. The heating plant has been also of considerable service in meeting threatened competition by isolated plants.

The Grand Forks Gas and Electric Company is now under contract with the General Electric Company for a 500-kilowatt turbo-generator set consisting of a Curtis steam turbine and a General Electric 240-volt generator to be equipped with a balancer set for three-wire distribution. The turbine unit will be run condensing in the summer time when the demand for exhaust steam is slight. Circulation water will be drawn from the Red River of the North, nearby, by electrically driven centrifugal pumps.

Two generators are direct-connected to each engine and arranged to supply a three-wire system.

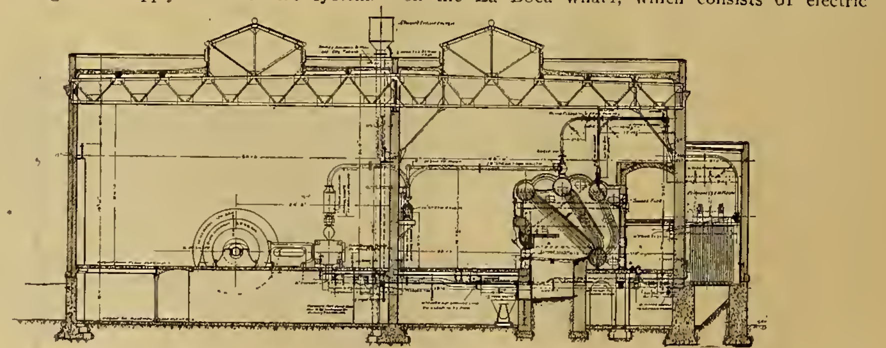


FIG. 4. SECTIONAL ELEVATION THROUGH GRAND FORKS STATION

The 210-kilowatt and 80-kilowatt generators were supplied by the General Electric Company. The two 40-kilowatt units driven by the Russell engine were made by the Northern Electrical Company, Madison, Wis.

The switchboard is of the ordinary direct-current type and is provided with the usual switches, circuit-breakers, meters, etc. Near the switchboard, as shown in Fig. 1, will be seen the motor-generator set of 100 kilowatts capacity used to supply alternating current at 2,300 volts to the outlying districts, where this company does a lighting business.

The territory served by this plant includes the towns of Grand Forks, N. D., and East Grand Forks, Minn., on the opposite shore of the Red River. In general, the distributing system is of the ordinary pole-line construction. Direct current at 110 and 220 volts is furnished from a three-wire system.

The span, supported by steel towers, shown in Fig. 2, is the crossing over the Red River of the North, supplying East Grand Forks, Minn., which is directly opposite the power house. The river is classed as a navigable stream and there is a line of boats in service between towns north and south of Grand Forks. Between high and low water there is a rise of 47 feet. Consequently a form of span had to be devised which would allow steamers with high smokestacks to pass under the wires even at the time of high water.

The two steel towers on each bank of the river are 100 feet high and 378 feet from center to center. For the three-wire, direct-current system there are two 1,000,000-circular-mil and one 500,000-circular-mil bare copper cables suspended by extra strain insulators from steel suspension messenger cables. In the same way a three-wire cable carrying three-phase current at 2,300 volts is suspended above the direct-current lines. It supplies distant sections of the Minnesota town.

The distribution lines at present are confined almost entirely to the business section of Grand Forks, but, according to plans, will shortly be extended into the residence portion of the city.

So far the ordinary demands for current have kept pace with the development of the plant, and no special or novel system of business-getting has been employed. But it is the intention of the company soon to adopt some such methods. Besides the use of its current for lighting, the company has secured a large part of the possible power business and is operating motor-driven machine shops, foundries and all the newspaper presses in both cities.

The preliminary plans of the new station were outlined early in 1906 by Mr. W. J. Murphy, general manager of the company, and Mr. Thomas Roycraft, superintendent, who have kindly furnished the Western Electrician with the data used in the preparation of this article.

Later details were arranged and the plans drawn by Sargent & Lundy, consulting engineers, Chicago. The structural steel was placed by the Minneapolis Steel and Machinery Company, Minneapolis, Minn. The coal-handling derrick was furnished by the Dobbie Foundry and Machine Company, Niagara Falls, N. Y. The traveling crane in the engine room was built by the Whiting Foundry Equipment Company, Harvey, Ill.

The supervision of the work of erection of the station from the outlining of the plans until the final starting of the machinery was in charge of Mr. Thomas Roycraft, the present superintendent of the company.

ELECTRIC POWER ON THE ISTHMUS

The new electric power and lighting plant at La Boca, Isthmus of Panama, has passed from the management of the Panama Railroad Company to that of the division of motive power and machinery of the Isthmian Canal Commission. With the plant goes also the control of the La Boca, Ancon and Corozal electric lines, except that part of the plant on the La Boca wharf, which consists of electric unloading cranes and the transmission line serving them. The equipment in the La Boca plant consists of one 60-kilowatt direct-current generator, one 325-kilowatt direct-current generator, one 60-kilowatt alternating-current generator, one 200-kilowatt alternating-current generator, one 20-kilowatt motor driven exciter, one 20-kilowatt engine-driven exciter, a large horizontal surface condenser, five 125-horsepower Manning vertical boilers equipped for oil burning and fed from four tanks located on a small hill in the rear of the plant.

In connection with this power plant there is being erected an air-compressing plant, which will be ready for operation about the middle of September. The La Boca marine shops wi'l be driven by two 75-horsepower induction motors now on order.

SYMBOLS FOR PHYSICAL QUANTITIES

By Miles Walker

It is very desirable to have a notation for the representation of physical quantities in scientific books and periodicals which shall be the same in all languages.

The subject is under the consideration of the International Electrotechnical Commission, with a view to international agreement, and committees in the different countries (in England under the chairmanship of Lord Rayleigh) are discussing this particular subject. They are dealing more especially with symbols for electrical and magnetic quantities, but the system might with advantage be extended to embrace all important quantities in physical science, especially as the subject is receiving the attention of most technical societies with a view to some action being taken in the matter.

FIG. 5. EXTERIOR VIEW OF CENTRAL STATION AT GRAND FORKS, N. D.

There are, however, two great difficulties which arise when we try to fix upon a standard notation. The first is the difficulty of persuading a number of writers and readers who have become accustomed to a certain symbol for a certain quantity to change it in favor of an equally large number of writers and readers who have become accustomed to another symbol. For instance, in France and Germany, the letter I commonly represents the strength of an electric current, while in England and America C is more commonly used.

In the second place, there are not enough letters in the two or three alphabets at our disposal to give a distinct symbol to each quantity without resorting to the combination of more than one letter to form a single symbol. There is a great objection to this combination of letters, because the use of subscript letters and numbers is required for distinguishing between particular quantities of the same general kind. If, for instance, C represents current, C_a might conveniently represent armature current and C_1 the current in circuit No. 1. It would therefore not be good to take C_a to represent capacity, or any other quantity other than an electric current.

There is, moreover, an objection to using letters at all to represent quantities in a universal notation, because, unless initial letters are used, there is no connection in the mind between the letter and the quantity, and the symbol is difficult to remember. We cannot always use initials, because the initial letters differ in different languages. For instance, in England, R commonly stands for resistance, while in Germany it is more convenient to use W for widerstand. Moreover, the same initial occurs for a great number of different quantities. For instance, R might stand for resistance, reluctance, reactance, radius, etc.

FIG. 6. COAL-HANDLING APPARATUS AT GRAND FORKS STATION

One way of avoiding the above difficulties would be to create a number of new symbols which could be printed by means of type like ordinary letters, and which would represent each physical quantity in a distinctive manner.

The question, however, arises as to whether a number of entirely new symbols would be acceptable to writers, readers and printers alike, and the sub-committee on symbols appointed by the British section of the commission has requested the writer to place his views publicly before the profession, with a view of obtaining suggestions and criticisms as to the feasibility of such a scheme from as wide a circle as possible.

In choosing a symbol, we would try to make a very simple picture of something that reminds us of the quantity in question. For instance, ǀ might represent temperature. If we were told that this simple outline of a thermometer represents temperature, we would have no difficulty in remembering it. Similarly, / might represent force, and the various "forces" might be derived from it; for instance ϟ electromotive force (conventional representation of lightning); and ∩ magnetomotive force.

It is not my purpose here to say what would actually be the best form of symbol for each quantity, but it is not a difficult matter to devise very simple characters which can be written quickly, easily and with sufficient accuracy, and which can at the same time assist the memory to connect them with the quantity for which they stand.

What would the printers say to the new type? The author has taken up this matter with a very large publishing firm, and is assured by their chief expert that 200 or 300 new type would be a small matter to a modern printer, who is already accustomed to deal with many hundreds of different fonts, each of which contains from 30 to 120 different symbols. He estimates that a printer in a large way of business has at his command as many as 60,000 distinct types, differing from each other either in letter, size, body or face. The addition of 200 or 300 more would be a drop in the ocean. The size of the new type could be standardized for most purposes, and it would only be in some special case that another size would be called for.

The setting up of the formulæ with the standard size of type would be simpler than with the present system, in which subscript letters are often unnecessarily introduced. One symbol under the present system sometimes consists of four or five letters.

If it be admitted that the introduction of new symbols is advisable, the question arises, What shall the new symbols represent exactly? Shall the sign ǀ (temperature) represent temperature in any units, or shall it represent the number of degrees of temperature, measured by some scale agreed upon, and embodied in the definition of the symbol? If the system of units employed be not prescribed, fewer symbols would be required, and the general writer who now says vaguely "Let T equal the temperature," would find the symbol sufficient for his purpose.

But, from the reader's point of view, there is much to say in favor of a symbol which will embody in its definition a standard system of units. Any formula expressed in such symbols would be completely self-contained, and would be an exact statement of a physical fact. Until the units employed in any formula are known, the formula expresses only half its meaning. Perhaps some slight addition to the symbol, or even to the whole formula, might be used to indicate that the standard system of units is employed. Without that addition, the symbol would have a general meaning. For instance, ǀ might equal temperature, while ǀ might indicate the degrees Centigrade above the absolute zero. The name of the type might be the name of the physical units which it represents; for instance, for ϟ we might read "volts."

If writers, printers and readers who have any definite views as to the best method of devising a system of symbols would communicate with the technical press, or with the author, they might assist in solving the many difficulties which arise in connection with this matter.

[Mr. Walker may be addressed at The Cottage, Leicester Road, Hale, Altrincham, England.]

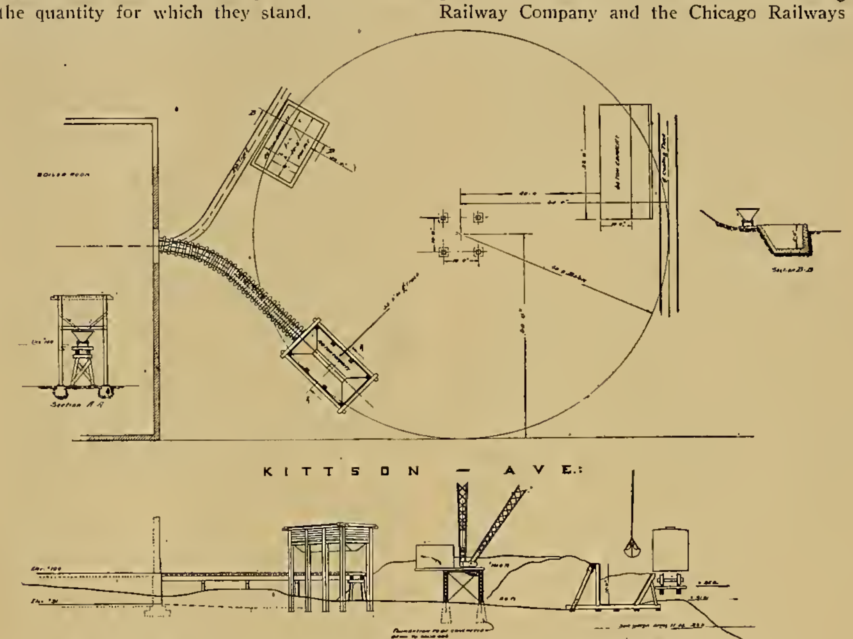


FIG. 7. DETAILS OF COAL STORAGE YARD AT GRAND FORKS STATION

CHICAGO STREET-RAILWAY REHABILITATION AHEAD OF SCHEDULE

The Board of Supervising Engineers, Chicago Traction, foresees that the work of rehabilitation provided for in the franchises to the Chicago City Railway Company and the Chicago Railways Company will be completed in advance of schedule time.

Each of the companies was given three years from the date of the acceptance of the ordinances to modernize its tracks, cars, and other equipment. So steadily has this work progressed that the supervising engineers are confident of reaching their goal with time to spare.

As the City company accepted its ordinance nearly a year before the Railways company, which did not take that step until last May, it is much in advance of the latter in its improvement, and, in fact, is several months "ahead of schedule." It has completed more than half of its track construction, underground work, and building erection, and has the full quota of 800 cars prescribed by the ordinance already in service.

The carrying on of the improvements already made has meant, it is said, the expenditure of more than $10,000,000 and the employment during an overcrowded labor market of thousands of men, 10,000 having been employed by the two companies at one time.

The records of the Supervising Board show that the City company has completed 56 miles of track reconstruction and six miles of miscellaneous track, including extensions. The Railways company has rebuilt 52 miles of its right-of-way. In this work the two have spent $5,250,000.

An impediment to more rapid track construction has been found in an unusual shortage of granite block, prescribed by the ordinance as the material for use in paving between the rails. In June only 15,000 square yards could be secured when 50,000 yards was needed.

MULTI-OFFICE AUTOMATIC SWITCHBOARD TELEPHONE SYSTEMS[1]

By W. Lee Campbell

This paper treats of three principal topics:

1. The enormous economic waste which the wire, cable and conduit equipment of a telephone system involves.
2. A recapitulation and discussion of reasons which make this waste necessary or expedient in manually operated systems.
3. How this waste can and should be greatly reduced in systems employing automatic switchboards.

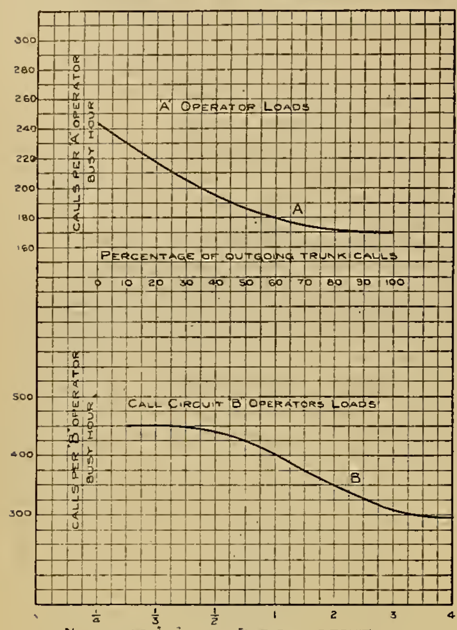


Fig. No. 1
Operator's Loads

In other words, as most automatic switchboard plants have been installed in conformity with practices which emanated from experience with manual switchboard systems, the writer will discuss some of the reasons for these practices and endeavor to show that they can profitably be ignored in plans for automatic systems. To accomplish this he has made a study of the principal factors in the first cost of plants of both types, together with certain factors in their operating expenses.

The first cost of a telephone plant using switchboards of either type may be divided into three principal items:

1. Cost of the apparatus (both central office and subscriber's station).
2. Cost of the central-office buildings and furnishings.
3. Cost of the wire, cable and conduit plant.

In the third item of the first cost—the wire, cable and conduit plant—we find the largest factor of the three. The writer will not attempt, however, to give any average figures on the amount of this item. It is a variable quantity. Under almost any circumstances this part of the system will cost more than the two other parts combined; not infrequently it represents two-thirds of the entire first cost of the system.

It will, therefore, probably tax the credulity of engineers whose experience has been in connection with electric power and lighting when the writer states that in the average telephone system containing one central office only nine-tenths of the cable and wire plant is idle—not in use for transmitting conversations, even at the peak of the load; and, too, that on the average during 24 hours' service, 98 per cent. of the wires are not in use. Yet such is the fact. Indeed, from observations made in a large number of automatic plants during the busiest hour, it was found that in offices of from 8,000 to 10,000 lines, handling a comparatively heavy traffic, the maximum number of conversations taking place at one time was equal to slightly less than four per cent. of the number of lines in service. As each conversation represents two lines, this would indicate a maximum of eight per cent. of the lines engaged for conversation, operating and signaling at the peak of the load.

Excepting party-line service, which at best is but a partial remedy, there is only one method known to telephone engineers of today for materially reducing the great economic waste represented in the 90 per cent. of the costly cable, wire and conduit equipment which is not in use even during the "rush hours." This method is to divide up each plant so that instead of one large central office it will employ a number of smaller offices. Just how much saving can be effected in this way, depends upon the local conditions in each city; but it will be readily understood that if small central offices or stations should be distributed over a city at the centers of well-selected districts, the telephones in each district being connected only to the local station, the subscribers' lines would be decidedly shorter and cheaper than when all run for many blocks to a large centrally located office. For interconnecting between the district stations, only trunk lines would be needed, and it is necessary to have only enough of these to handle the busy-hour traffic; that is, the trunk lines need to be but a small percentage of the number of wires which would be installed if each telephone should be directly connected to one large central office.

The writer does not wish to convey the idea that in manual practice systems are not divided up to save wire and cable; for in a very large city, covering a great area, this must be done. For example, in Chicago there are 15 or 16 central offices averaging about 3,000 lines each. But division of an office of less than 10,000 lines is generally regarded as undesirable and to be avoided wherever possible. It is, therefore, the general practice in smaller cities to carry all or the bulk of the business on one large board, smaller branch boards being installed under suffrance and only for urgent reasons. The writer hopes to demonstrate that while this antipathy toward dividing offices of 10,000 lines or less is reasonable in manual practice, it is not reasonable in automatic practice.

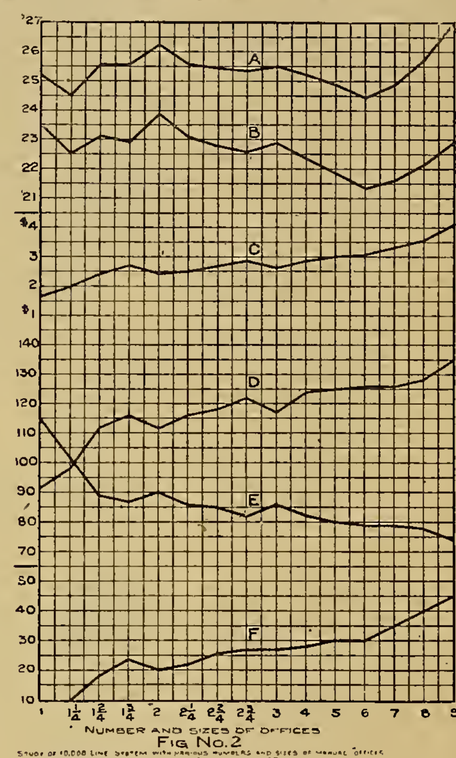


Fig No. 2

Study of 10,000 line system with various numbers and sizes of manual offices
Estimated 173,500 calls per day Estimated 21,687 calls during busy hour
Curve "A" shows combined costs of curves "B" and "C"
Curve "B" shows cost per line of central office equipment
Curve "C" shows cost per line of building space required for central office equipment [illegible]
Curve "D" shows number of "A" operators' positions required at all offices
Curve "E" shows the average number of lines served by each "A" operator's [illegible]
Curve "F" shows total number of "B" operators' positions

In manual systems an operator's daily quota of connections is reduced when part of the calls which she handles must be trunked to other offices. This effect of trunking on the operator's work is indicated by curve *A*, Fig. 1, which gives the number of flat-rate, busy-hour connections which one of the largest manual operating companies has found that an average "A" operator will make with various percentages of trunked calls. It is, therefore, necessary in a multi-office manual system to install and to provide space for more "A" operators' positions, as well as to install and provide space for "B" operators' positions and to provide increased space for rest rooms, etc.

As an illustration, in Fig. 2, curves *D*, *F* and *E* show, respectively, the number of "A" operators' positions, the number of "B" operators' positions, and the average number of lines per "A" operator's position for a hypothetical 10,000-line system with different numbers and sizes of offices. The numerals along the bottom of the diagram, which indicate the various numbers and sizes of offices, have the following significance:

$1\frac{1}{4}$	represents	1 office of 8,000 lines. 1 office of 2,000 lines.
$1\frac{1}{2}$	represents	1 office of 6,700 lines. 2 offices of 1,650 lines each.
$1\frac{3}{4}$	represents	1 office of 5,725 lines. 3 offices of 1,425 lines each.
2	represents	2 offices of 5,000 lines each.
$2\frac{1}{4}$	represents	2 offices of 4,450 lines each. 1 office of 1,100 lines.
$2\frac{1}{2}$	represents	2 offices of 4,000 lines each. 2 offices of 1,000 lines each.
$2\frac{3}{4}$	represents	2 offices of 3,650 lines each. 3 offices of 900 lines each.
3	represents	3 offices of 3,333 lines each.
4	represents	4 offices of 2,500 lines each.
5	represents	5 offices of 2,000 lines each.
6	represents	6 offices of 1,667 lines each.
7	represents	7 offices of 1,429 lines each.
8	represents	8 offices of 1,250 lines each.
9	represents	9 offices of 1,111 lines each.

It will be noted that the number of "A" and the number of "B" operators' positions grows quite rapidly as the number of offices is increased, while the number of lines per "A" operator's position diminishes.

Curve *B*, Fig. 2, gives the approximate cost per line of the central-office equipments installed as derived from the data used in curves *D*, *F* and *E*, previously mentioned. In the same Fig. 2, curve *C* shows the cost per line of the buildings for the various sizes and numbers of offices in the divided system. The cost of space required for executive offices, storage, etc., is not included in these figures, nor do they include the cost of land and furnishings. Curve *A* shows the combined cost per line of central-office equipment and buildings. It will be noted that the greater cost of buildings is, to some extent, counterbalanced by a reduction in the cost of the equipment. The small increase would in any event be of little moment in comparison with the saving in the cost of the wire, cable and conduit plant, which might be secured by plant division. It would, therefore, appear that we must look further for the cause of the objections to multi-office manual systems.

Before discussing operating expenses, however, let us see what effect plant division has on the first cost of automatic central-office apparatus and buildings. To illustrate the effect, the curves in Fig. 3 have been worked out, using the same 10,000-line system and the same numbers and sizes of offices employed in Fig. 2 for the manual system. The cost, installed, of central-office equipment is somewhat increased by division, as will be noted by reference to curve *B*. The central-office space required is also greater, as shown by curve *C*, Fig. 3.

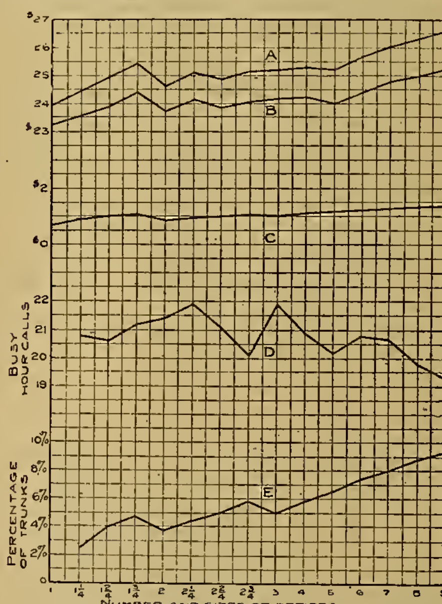


Fig. No. 3

Study of 10,000 line system with various numbers and sizes of automatic offices
Estimated 173,500 calls per day Estimated 21,687 calls during busy hour
Curve "A" shows combined costs of curves "B" and "C"
Curve "B" shows cost per line of central office equipment
Curve "C" shows cost per line of building space required for central office equipment
Curve "D" shows the average number of busy hour calls carried per trunk line, between offices
Curve "E" shows the ratio of the total number of trunk lines between all offices to the 10,000 subscriber's lines entering all the offices of the system.

The slow increase in the combined cost of equipment and building as more offices are added is shown by curve *A*, Fig. 3. The increases are of small import in comparison with the saving in the underground and aerial construction secured by using a larger number of offices.

Taking up the subject of operating expenses, the writer would direct attention first to curves *A* and *B*, Fig. 5, which give the central-office labor expense as shown in Fig. 4, plus the cost per line per annum of certain central-office equipment and central-office building charges that are materially affected by plant division. Curve *A* is for manual offices of from 1,000 to 14,000 lines, no trunking, and curve *B* gives similar data for automatic offices. These figures include insurance, taxes, interest and depreciation on central-office equipment and buildings, renewals for central-office equipment, and the cost of lighting and power.

Insurance of the central office equipment in fire-

1. A condensation of a paper read at the annual convention of the American Institute of Electrical Engineers, Atlantic City, June 29, 1908. The author is assistant superintendent of the Automatic Electric Company, Chicago.

proof buildings is taken at one per cent. per annum.

Taxes on both types of equipment are figured at the rate of 1.5 per cent. per annum; interest is figured at six per cent. per annum for both.

Depreciation on manual central-office equipment is figured on an average life of 10 years, and a two per cent. charge is made for maintenance materials and renewals. Depreciation on automatic equipment is calculated on a life of 12 years. The amount which must be set aside annually at six

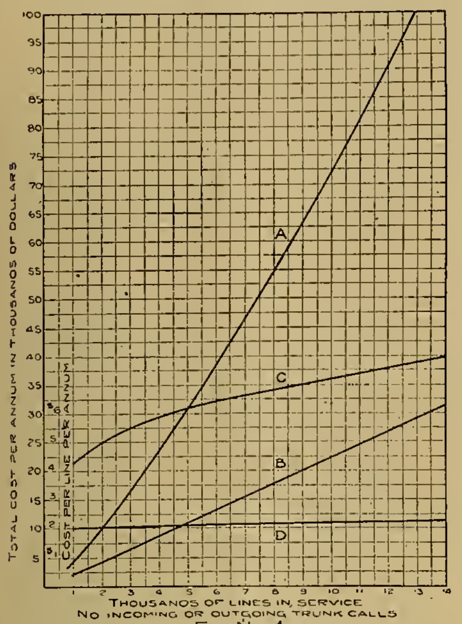


Fig. No. 4

Cost of labor for operating, repairing and maintaining all central office equipment except "Long Distance Board" includes also wire chief and assistants, trouble and information clerks

Curve "A" Gives total per annum for manual equipment
Curve "B" Gives total per annum for automatic equipment
Curve "C" Gives cost per line per annum for manual offices
Curve "D" Gives cost per line per annum for automatic offices

per cent. compound interest to equal 100 per cent. in 12 years is six per cent. of first cost. Therefore, this percentage is used in calculating depreciation on automatic central-office equipment, while for manual equipment the depreciation charge is taken at 7.5 per cent., which is the amount which must be set aside annually at six per cent. compound interest to equal first cost in 10 years.

Maintenance material or renewals has been taken at 0.5 per cent. for automatic offices.

The annual charges on the central-office buildings have been taken at the same rates for the two systems; that is, insurance on fireproof central-office buildings has been figured at 0.5 per cent. per annum, interest at six per cent., taxes at one per cent., and depreciation and repairs at two per cent. per annum.

In order to illustrate the effect on the annual expenses, just discussed at length, caused by dividing a system up so that it employs a number of offices instead of one, the writer has constructed the curves in Fig. 6, which show what the expenses would be for the different numbers and sizes of offices in the hypothetical 10,000-line system used in Figs. 2 and 3. Referring to curve *A*, in Fig. 6, it will be noted that the annual cost of central-office labor for the nine-office arrangement of the manual system is 80 per cent. greater than for the single-office arrangement.

It might be stated just here that the item of operators' hire is one which yearly grows to greater magnitude. One very large telephone operating company instructs its engineers engaged in development studies to estimate on operators' salaries being at least 15 per cent. higher 15 years hence.

Curve *B*, Fig. 6, shows that the increase in the cost of labor plus the annual charges on equipment and buildings, weighs heavily against the division of manual systems. In fact, experience shows that where the ultimate number of subscribers that may be expected in an office district within 15 years does not exceed the capacity of a single multiple board (about 10,000 lines), and there is no concentrated group of subscribers at a considerable distance from the best location for a single office, it is generally found that a one-office system will be the most economical when manual equipment is used.

It is, of course, necessary to make a thorough engineering study of each apparently suitable location for a branch office, to determine whether or not any real economy would result; but since the annual charges on subscribers' lines less than two miles long using No. 22 gauge cable conductors average about $2.50 per mile, it will be seen that the saving in length of line will be less than the corresponding increase per line per annum in central-office expenses (indicated by curve *B* in Fig 6) except where the lines are comparatively long. Roughly speaking, an economical arrangement of the average divided manual system will include offices not much less than two miles apart.

Curve *C* in Fig. 6 shows that division of automatic systems may be profitably carried much further on account of the slow increase in central-office expenses resulting from adding to the number of offices.

There is still another point to be considered, namely, the effect of plant division on service. An investigation of this reveals what is a very serious objection to a multi-office manual system; because slower service, more mistakes by the operators, and, what is most aggravating to a telephone subscriber, more premature disconnections during conversation, are the inevitable results of having connections handled by two operators instead of by one. The good-will of the telephone user is something which cannot be lightly considered in these days of keen competition.

Increasing the number of offices in an automatic system does not appreciably affect the service. All calls are trunked anyhow, whether one office is used or many. Therefore, splitting up such a system does not add to the amount of trunking or in any way affect the speed and uniformity of service.

Not only has the writer not discovered any reasons which weigh materially against division of automatic systems, but he finds that the saving in the investment in cable, wire and conduit would be even greater than in a manual system. First, because division may, as clearly shown, be carried much further without seriously affecting central-office expenses, and second, because the number of trunk lines required for handling traffic between automatic offices is less than between similar manual offices.

As a rule, a manual trunk should not be expected to handle over 15 to 18 calls during the busy-hour, even between rather large, well-managed offices; between small offices from 10 to 12 is all that can safely be depended upon. Between automatic offices a considerably higher trunk-carrying capacity is experienced. The largest number of trunks per group almost universally used in automatic systems is 10. With groups of this size a minimum carrying capacity of 22.5 busy-hour calls per trunk is secured. This is a decided increase over the carrying capacity of manual trunks, even where the latter are installed in groups of the greatest efficiency; that is, groups of about 73 circuits each. It would rarely, if ever, be possible to obtain such a large group if a manual plant were so divided that all offices were comparatively small, but in almost any multi-office system the majority of the trunks between offices can readily be placed in small groups of 10 trunks each. Consequently, in an automatic multi-office system maximum efficiency is secured on nearly all of the trunks. This

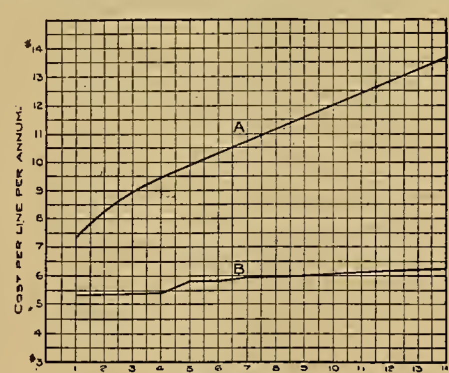


Fig. No. 5

Curve "A" Shows cost per line per annum for operating manual central office as shown by curve "C" Fig 4 plus cost of power, lighting and interest, depreciation, taxes and insurance on central office equipment and on central office building

Curve "B" Same as "A" but for Automatic equipment (See curve "D" Fig 4)

is illustrated by curve *D*, Fig. 3, which gives the average minimum carrying capacity per trunk for each of the different arrangements of the hypothetical 10,000-line system. The average minimum number of busy-hour calls carried per trunk is, according to the curve, about 20.75, and the lowest figure is 19.3 for the nine-office arrangement. Supposing, for the moment, that it be practicable to use this nine-office arrangement in a 10,000-line manual system, the average number of busy-hour calls carried per trunk would be about 12.

The small number of trunks that will carry the traffic between automatic offices even in a thoroughly divided system is illustrated by curve *E*, Fig. 3, which shows the ratio on a percentage basis between the number of trunks and the number of subscribers' lines. With the largest number of offices considered this percentage is but 9.3.

One reason for the increased efficiency of automatic trunks is found in the shorter length of time per connection. In manual practice it has been found that each trunk is occupied on the average at least two minutes per connection, whereas automatic experience proves that during the busy hour a trunk is not occupied over 83 seconds per average connection. A subscriber to automatic service answers his telephone quicker and generally does not hold the line so long for conversation as does a manual subscriber; also, the disconnection is made much quicker in the automatic system. This feature of the quicker disconnection is especially helpful during the busy hours, when manual operators are most likely to be rushed and consequently slow about pulling down connections.

In endeavoring to form some conception of the

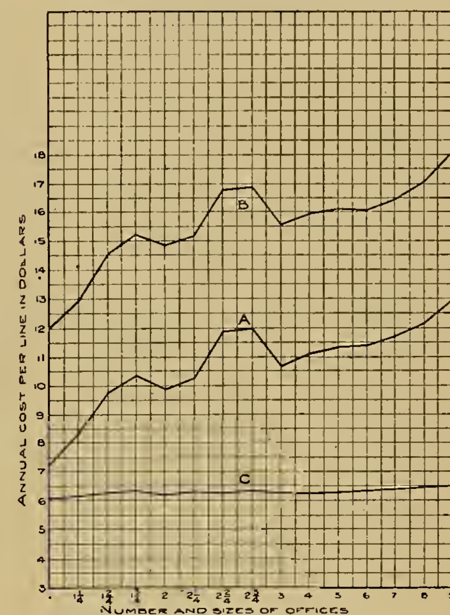


Fig. No. 6

Curve "A" Gives annual expense per line of all central office labor for a 10,000 line manual system with different numbers and sizes of offices the same as used in Fig 2

Curve "B" Shows labor cost as given by curve "A" plus interest, taxes, depreciation maintenance and insurance on manual central office equipment and on central office buildings, also plus cost of lighting and power.

Curve "C" Shows for a 10,000 line automatic system (See Fig 3) the same items as those given in curve "B" for a line manual system

methods used for introducing trunking of calls on a large scale between automatic offices, it is well to understand the difference between two general types of office that are being used for this purpose. One is known as a "sub-station" or "district" office and the other as a "branch" office. The difference lies in that a sub-station contains line switches and connector switches, but no apparatus for making local connections; that is, every originating call is trunked to a distant larger office containing the selector switches, whereas a branch office contains switches of all classes and completes within itself all local connections demanded.

One of the peculiarities of the telephone business, especially when there is competition, is that an operating company is compelled to take on the new business offered. It must keep up with its rival or drop out of the race. A user of electric light doesn't care how many other customers are connected to the same plant as he is, but a telephone user is, of course, very much attracted by the larger of two lists of subscribers. Unfortunately, a one-office plant is somewhat like a water or gas plant, in that new customers cannot be constantly added by simply connecting their service pipes to the mains originally installed. Some day a point is reached when the mains are supplying all the flow of which they are capable, and it is necessary to go back to headquarters, dig up the streets anew, and put in more mains or larger ones. So in a one-office telephone system, if the growth is more rapid than anticipated, as it often is, or if the growth of the city takes place in an unexpected direction, as it frequently does, it becomes necessary to remodel the cable and wire plant to suit the new distribution of business.

A one-office telephone plant sometimes must be almost entirely rebuilt within a few years of its installation, in order to adapt it to a shifting of population, or to make it adequate for the customers' unexpectedly demanding service.

With a multi-office automatic system, this need not be done. If an unexpected demand for telephones develops in a certain section of the city, it is not necessary to put in more conduits and cables or to replace present cables with larger ones to take care of the demand, but the situation is readily and practically met by putting in a sub-station or a branch office in the congested district. The present line cables running to the district may be used as trunk cables to the new office. Thus the traffic-carrying capacity of the cable and conduit plant reaching any district may be greatly multiplied without any additional expenditure for cable or duct. Consequently, one of the most attractive features of an automatic multi-office system is that it affords a stable value to the investment in wire, cable and conduit.

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

DOUBLE-DECK CARS have never found favor in this country, although extensively used in England. They are cumbersome, slow to load and unload, not adapted to the climate, require two conductors or else impose too great a burden on one conductor during "rush" hours, and make headroom demands not suitable to American cities with their elevated-railway structures. And yet, on a fine day, riding on the roof of a double-deck car is very pleasant, and many returned travelers have wondered why American street-railway managers have not made greater use of this form of conveyance. The reason is that they are not adapted to the rush and "hustle" of street-railway service in this country. Nor are they looked on with favor, apparently, by progressive managers in England. Sir Clifton Robinson declares that one of the handicaps of British tramway companies is the use of double-deck cars. He adds that the adoption of this type of car was due to the regulation that no car should be licensed to carry any passenger for whom no seat was provided. The day will come, perhaps, when the double-deck car will be as unusual a sight in Great Britain as it is now in the United States, for it is not a feature of practical and progressive street-railway service.

FIFTY YEARS ago, on the 17th day of this month, the first telegraphic messages were exchanged between Europe and America. After great difficulties a transatlantic cable was laid between Ireland and Newfoundland, and on August 17, 1858, the first message was sent from the Old World to the New. It read thus: "Europe and America are united by telegraph. Glory to God in the highest; on earth peace and good will toward men." A message was sent also from Queen Victoria to President Buchanan, and the latter made appropriate answer. Commercial success of the cable was quickly demonstrated, but currents of too high potential were used, and on October 20th the cable went "dead." But Cyrus W. Field—that great man to whose courage and energy the laying of the cable was largely due—was not discouraged, and after several years of effort he secured sufficient capital to make another attempt, which was finally brought to a successful issue in 1865. Since then cables have been laid in all the Seven Seas, the latest great ocean to yield to the time-annihilating electric circuit being the Pacific.

The laying of the first Atlantic cable was a very great achievement, and its semi-centennial should not be allowed to pass unnoticed.

WHAT OF THE marine possibilities of the gas engine? Are the boilers, steam engines or steam turbines and smokestacks of the present steamship to be done away with in favor of the smokeless gas producer and gas engine? Will the very terms "steamship" and "steamer" become obsolete, and shall we have "gas-ship" and "gasser," uncouth as these words now appear? These are questions that are attracting some attention.

Mr. Robert Heywood Fernald, a mechanical engineer who has been connected for several years with the fuel investigations of the United States Geological Survey, is an enthusiastic advocate of the gas engine, and he predicts that internal-combustion motors will be installed in naval vessels of the United States within the next few years. "I expect to see the United States ahead of every other nation in this innovation," said Mr. Fernald. "The gas engine, in my opinion, is feasible on any vessel because of its economy over the steam engine, but it is especially desirable on the fighting ship for the reason that it makes no smoke. The gas is generated in a producer which has no chimney and needs none. The coal is turned directly into gas which goes straight to the engine." Mr. Fernald also asserts that where an ocean liner consumes 10,000 tons of coal on a round trip, but 6,000 or 7,000 tons would be required with gas engines. He declares that one of the important steamship companies of the Great Lakes is about to take the initiative in this movement. Plans have been made for a freighter that will use a 2,000-horsepower gas engine. This company is not making the experiment because of the smoke from the stacks of its vessels, but in order to demonstrate the economy of the gas engine over the steam engine.

The United States government, through the Geological Survey, has been experimenting with the gas producer and gas engine for several years and has demonstrated, apparently, that this type of engine in a stationary plant is capable of generating from twice to three times as much power from a given amount of coal as the steam engine. It has also shown that the gas engine can develop more power from a low-grade coal, such as the lignite of North Dakota, than the steam engine can with the same weight of the best bituminous coal. The purpose of the government has not been to develop the gas engine, but to increase the efficiency in the utilization of the coal supply of the country, which is now being used at an enormous rate.

Of course marine architects and engineers must be well assured of the reliability of the gas engine in large units for shipboard service before relegating the steam machinery to the scrap heap. Mr. Fernald's prediction may come true for large ships, for, of course, there are large numbers of small craft that use gas engines, but it will be only when vessel designers feel reasonably confident that there will be no breakdown at sea of machinery subject to the vibration and shocks of ocean service.

THERE ARE more ways of killing a cat than choking it to death with butter, as some astute observer remarked long ago. England is a free-trade country in name, but the recent Patents and Designs Act is essentially protective in principle. By the provisions of this law any person may apply to the proper authorities at any time not less than four years after the date of a British patent and not less than one year from the date of passing the act (August 28, 1907) for the revocation of that patent when it protects the manufacture of an article made exclusively or mainly outside of the United Kingdom. This is of course a protective measure to encourage British manufactures, and no one can quarrel with the people of the United Kingdom from adopting such domestic measures as they think adapted to advance their own interests. The measure will affect principally American and German manufacturers, and as both are protected at home, they cannot consistently make a very loud outcry. Among others, American owners of electrical patents taken out in Great Britain are affected to some extent, and, as reported in a brief article given elsewhere in this issue, there are several American electrical manufacturers who have started to erect factories in England, to be on the safe side, although at the present time it is not known how rigorously the law will be enforced when the courts come to make interpretation of it.

MR. WALKER'S proposed system of symbols for physical quantities, as set forth on another page of this issue, is of great interest. The typical picture-symbols designed for international use are simple, so far as suggested, and would be readily recognized in general outline. But if the number were increased to a hundred, or several hundred, say, there would be more difficulty in memorizing them. And in increasing the number there might be danger, owing to the variation in form being slight, that one might be confounded with another. Even in the five characters which Mr. Walker gives there are two which resemble each other closely. These are , meaning "temperature," and , meaning "degrees Centigrade above absolute zero." Now these characters are purposely made alike to indicate their relation, but experienced writers for the press and printers and proofreaders know that it is desirable to have type characters vary from each other, rather than to make them resemble each other with but minute differences, if accuracy in printing is to be obtained with practicable speed.

We are not opposing the picture-symbol idea which Mr. Walker lays before the electrical engineering profession. On the contrary, we think it worthy of careful attention. The point we make is that if new characters are to be devised, they should be simple, rugged and bold in outline, each one differing distinctly from all others. This can be done, no doubt, and still preserve the association of ideas for assistance in memorizing; but if not, it will be better to make the symbols simple and clear even at the cost of making them purely arbitrary and not following the logical system of a root sign with additions.

THE FARE QUESTION

Charles V. Weston, president of the South Side Elevated Railroad, Chicago, has made a statement of the condition of his road in which he contends that the company is now giving for five cents an average ride per passenger the cost of which should properly be figured at 6.95 cents. He is willing to accede to the demand of the city authorities for through routing and universal transfers, he says, but not on a five-cent basis, which he believes would involve the participants in bankruptcy.

Regarding South Side Elevated, he assumes, for argument, a daily average of 125,000 passengers for a year, or a total of 45,625,000, producing at five cents a revenue of $2,281,200. Operating expenses, at 70 per cent., including Loop rental and taxes, would be $1,596,875, leaving net revenue $684,325, from which should be deducted the following: Bond interest, $360,000; rental of leased lines, $96,000; depreciation at 2½ per cent., $499,311; interest on capital stock at six per cent. on $10,318,000, $619,380; total, $1,574,691.

Thus the total cost of carrying the 45,625,000 passengers is figured at $3,171,566, or 6.95 cents per passenger.

The South Side company, he concludes, is undercapitalized at $10,323,800.

"It has been demonstrated," said Mr. Weston, "that the length of the average haul is already greater than the maximum which will permit a reasonable return on the investment; yet the short haul is decreasing."

The three months' tests of three-cent fares with one-cent transfers by the Municipal Traction Company of Cleveland came to an end on July 27th. This experiment, it is asserted by Mayor Tom L. Johnson, who is treasurer and general manager of the company, was carried out to provide statistics for estimate. The results will not become available until the end of August, when the company's clerical force can reduce the data. Free transfers went into effect on July 28th and may be continued for a month, although the company has already practically admitted that a profit cannot be made under existing conditions with three-cent fare and universal transfers. The chances are that a flat rate below three cents will be established and transfers abolished, under which plan, instead of transferring, patrons would have to pay two fares.

MOTOR MANUFACTURERS' ASSOCIATION

At a recent meeting of representatives of manufacturers of electric motors in Hot Springs, Va., the American Association of Electric Motor Manufacturers was formed. One important object of the association is to foster and encourage and create demands for the use of electric power by educational means, following the lead of the Co-operative Electrical Development Association. Another object is to standardize equipment, and in general the new association will seek to promote the motor industry in every lawful way. The membership of the association consists of three classes: Class A, which includes manufacturers of direct-current motors up to and including 50 horsepower; Class B, manufacturers of alternating-current motors up to and including 50 horsepower; Class C, manufacturers of all types of motors above 50 horsepower.

A constitution has been adopted, and the following-named officers have been elected: President, S. L. Nicholson, Westinghouse Electric and Manufacturing Company, Pittsburg; vice-president (Class A), C. F. McGilvray, Robbins & Myers Company, Springfield, Ohio; vice-president (Class B), R. J. Russell, Century Electric Company, St. Louis; vice-president (Class C), F. S. Hunting, Fort Wayne Electric Works, Fort Wayne, Ind.; temporary secretary, J. C. McQuiston, Westinghouse Electric and Manufacturing Company, Pittsburg. The executive committee comprises C. W. Holtzer, Holtzer-Cabot Electric Company, Brookline, Mass.; C. H. Roth, Roth Bros. & Co., Chicago; B. C. Kenyon, Diehl Manufacturing Company, Elizabethport, N. J.; J. C. Hobart, Triumph Electric Company, Cincinnati; James Burke, Burke Electric Company, Erie, Pa.; W. A. Layman, Wagner Electric Manufacturing Company, St. Louis; J. W. Ham, General Electric Company, Schenectady; A. H. Whiteside, Allis-Chalmers Company, Philadelphia; and A. L. Doremus, Crocker-Wheeler Company, Ampere, N. J.

At the Hot Springs meeting 25 companies were represented by 31 men. The annual meeting of the association is to be held in May of each year, when papers and discussions will be considered, but a call has been issued for a meeting to be held for three days, beginning Monday, September 7th, at the Thousand Islands, St. Lawrence River, N. Y. The association has taken offices in the Engineers' Building, New York city.

THE NEW BRITISH PATENT LAW

About a year ago there was passed by Parliament an act amending the patent laws of Great Britain which is causing some activity among foreigners holding patents in England. The amending law is known as the Patents and Designs Act, 1907. One of its most striking provisions is Section 27, which deals with patents worked wholly or mainly abroad, and is undoubtedly designed to check the system under which patentees have in the past been enabled to take out patents in England, not with any intention of working them there, but with the object of preventing British manufacturers from producing articles which might compete with them, either in their own or other markets.

To discourage this practice the act provides that at any time not less than four years after the date of a patent and not less than one year from the passing of the act (August 28, 1907) any person may apply to the comptroller for the revocation of a patent on the ground that the patented article is manufactured, or that the patented process is carried on, exclusively or mainly outside the United Kingdom.

If the allegations contained in the application are found correct, the patentee must prove that the patented article or process is manufactured or carried on to an adequate extent in the United Kingdom or he must give satisfactory reasons why the article or process is not so manufactured or carried on. Any decision of the comptroller is subject to appeal to the courts.

Prior to the passing of the act patentees were under no restriction in the imposition of these conditions, it having been held by the courts that a patentee was entitled to impose any conditions, however unreasonable, on the sale or lease of articles manufactured under his patent. The degree of strictness with which the new regulations will be carried out is not yet manifest, but it is evident that a great deal will depend on the interpretation that will be put on the wording of the act by the courts. Particular interest attaches to the meaning to be given to the words "manufactured exclusively or mainly outside the United Kingdom" and what will be regarded as "manufactured to an adequate extent in the United Kingdom."

It is believed that a patentee will have to show at least that he has advertised a number of times that he is ready to license the manufacture of his patented device in Great Britain. In the absence of definite knowledge of the requirements a great many holders of English patents have taken the most unfavorable view of the situation and entered into contracts for the manufacture and sale of their patented products by British manufacturers. Those having larger interests at stake have spent large sums for erecting factories of their own on English soil, even if they are convinced they cannot manufacture there as cheaply as at home. Many smaller manufacturers have leased vacant factory buildings and are equipping them to make their own products. Among each of these classes are quite a number of American electrical concerns.

"In fact," said a representative of an American electrical firm now arranging for a branch and factory in London, "Americans now may be seen skirmishing all over this big town for factory sites or space in existing factory buildings. I have been amazed at the number of factories that are vacant. The patents act seems to me to be one of the most sensible measures the British have ever passed from their own point of view, although, of course, Americans, Germans and others are hard hit."

OPENING OF PHILADELPHIA'S SUBWAY

The first train to run through the new Philadelphia Subway left the Sixty-ninth Street station on Monday morning carrying, besides the regular passengers, General Manager Charles O. Kruger, Chief Engineer William S. Twining and other officials of the Rapid Transit Company.

The underground line of travel is around the City Hall and to the south to Second Street.

Practically nothing of the upper works on the subway stations has been completed on account of the haste to get the subway opened on scheduled time. Temporary wooden hand-railings were erected and signs indicated the entrance and exits. It will be some time before the finishing touches will be complete. It is estimated that close to 100,000 people patronized the subway during the opening day.

SUCCESS WITH SMALL CARBONS

For the last three years the arc-lamp department of the Commonwealth Edison Company of Chicago has substituted for the ordinary half-inch arc carbon smaller diameters and is now largely using a 5-16-inch carbon in enclosed arc lamps. Before the step was taken, as a part of an exhaustive investigation conducted by Mr. George N. Eastman (see Western Electrician, April 15, 1905, page 288), comparative tests were made by the Electrical Testing Laboratories in New York, and the smaller carbons were reported to give a light efficiency about 52 per cent. greater than the large standard half-inch rods.

The increased efficiency is explained by the fact that the small carbons, which are little bigger than a lead pencil, are heated to a high temperature for a greater distance from the tips. The white-hot portions extend almost half an inch from the tips while the carbon glows perceptibly for half an inch more.

This increased light-giving surface helps in the improvement in the quantity of the light, but much of the added efficiency is to be credited to the lesser shadows cast by the small carbons. The enclosed arc burns the carbons flat, and the flame is continually "hunting" around these surfaces, so that with large carbons considerable shadow prevails on the opposite side from the arc. This disadvantage is avoided with the small carbons. The smaller carbons burn more rapidly, of course, than the ordinary size under the same conditions of current, but this expense is more than offset by the increased efficiency of the light added to the relative cheapness of the small carbons.

The Commonwealth Edison Company is the only central-station company of any size in this country that has departed from the accepted standard size in favor of the 5-16-inch carbon. Certain European lilliputian arc lamps, however, make use of small carbons. The Chicago company maintains a large and well-equipped shop for arc-light repairs at 84 Market Street, where the 17,000 lamps on the company's city circuits are kept in order. Mr. P. J. Smith is superintendent of the Commonwealth Edison arc-light department.

MR. EDISON PLANS RESEARCH

There is probably foundation for the renewed reports that Thomas A. Edison is about to retire from his commercial-laboratory work to devote himself to working out problems to his liking, particularly in the field of chemistry. Mr. Edison is a man of wealth, and he can afford to give his time over to investigations in pure science.

As a young man Edison was greatly interested in chemistry, and now the inventor of the carbon transmitter, the incandescent lamp, the phonograph and other devices, is to return to the field of his early work. Moreover, he has promised his family to take more recreation in amusements and travel. Mr. Edison has a cottage in Florida, where he spends part of each year. About the end of August he is contemplating a trip to the Pacific Coast with his family.

Along with the change in Edison's career some important moves have been taken in his business affairs. Frank L. Dyer has succeeded E. Gilmore at the head of the Edison financial interests. In discussing the step taken by his retiring chief, Mr. Dyer is quoted as saying:

"Mr. Edison is anxious to devote more time to pure science and less time to commercial investigation. He plans to engage in the future in the kind of work done by Faraday, Clerk Maxwell, Helmholtz, Lord Kelvin and other scientists. He will not confine himself in future to the electrical field by any means. As a matter of fact, he is interested personally more in chemistry than in electricity. He has been delving into chemistry off and on since his boyhood. He is interested in all kinds of things aside from electricity. For months he has been working on an apparatus for the production of Portland cement.

"The change doesn't mean that Mr. Edison is going to stop work. He is the kind of man who thrives and lives on work. He couldn't stop working if he tried."

SINGLE-PHASE TRACTION IN LONDON

[From the London correspondent of the Western Electrician]

Of some interest is the scheme of electrification on the single-phase system which the London, Brighton and South Coast Railway Company is now installing between London Bridge and Victoria. The section of the line at present being electrified extends from Victoria, where, by the way, the company has just completed a very extensive new station, to London Bridge, a distance of nearly nine miles, equaling approximately 23 miles of single line. In Victoria station five platforms and two through lines, and in London Bridge station six platform lines are being electrically equipped. The improved service contemplated will require seven working trains and one spare one, each train comprising two third-class motor cars with baggage and motorman's compartments, each equipped with four 125-horsepower motors. The motor cars form the first and last cars of a standard three-car train, the middle one being a first-class trailer. It is proposed to give a 10-minute service throughout the day, and the time occupied by a journey from Victoria to London Bridge will be 25 minutes, including stops, as compared with 36 minutes as at present required by the steam trains.

The total seating capacity of each three-coach train is 188. A modified form of side-entrance compartment coach has been designed so that in the case of any one compartment being full, passengers can pass into the next without having to leave the carriage. The car bodies are 60 feet in length and nine feet in width.

The electrical equipment on the motor cars is so arranged that passengers cannot under any circumstances have access to any high-tension apparatus, which indeed is only accessible to the railway staff when the power is cut off and all high-tension connections connected to earth and thus rendered absolutely safe.

The overhead conductor consists of a heavy grooved solid wire, half an inch in diameter, which is supported at every few feet by means of wires suspended from stranded steel catenary cables, which are in turn suspended from massive porcelain insulators through a double insulation which has been tested to 10 times the working pressure. The insulators are supported upon specially designed steel structures. Due to the constantly varying nature of the line, many different types of support have had to be designed, the strength of these having been calculated on the basis of a factor of safety of 10 to 1, which has in all cases been worked to the overhead equipment The overhead conductor is divided into sections at each station, specially constructed switchgear being provided in fireproof cabins for the control of the sections. By this means it is possible to isolate any section of the line in case of necessity, and in order to secure the safety of those whose duty it will be to make repairs or carry out inspections, a system of interlocking has been devised.

A complete system of telephone communication exists between all the switch cabins, as well as the signal boxes adjoining them, and by the use of simple electrical relays the signalman can, in case of emergency, cut off the energy from the overhead line on the sections which are controlled by him.

In order to meet the conditions which have been imposed in relation to voltage drop in the return circuit, a special system of cables was rendered necessary, and a duplicate feeding system has been provided throughout the line.

The supply of energy is to be obtained from the London Electric Supply Corporation, in whose power station at Deptford special machinery has been installed. This consists of four 2,000-kilowatt units. For the normal work of the line it is estimated that one of these units will supply sufficient energy, so that there is little fear of failure due to lack of generating power. The price to be paid for this energy varies from 1d. (two cents) per unit to ¾d. per unit, according to the load factor, and there is a guarantee that when the load factor reaches 35 per cent. the price will be ½d. per unit. The supply company is also placed under penalties amounting to £150 a day for failure of supply. The present agreement is for seven years, when the railway company will have the right to demand a revision.

The tunnels at Denmark Hill have added a difficulty, owing to the nature of their construction, and to the curvature of the line in the tunnels. Practically, all kinds of construction that go to form a railroad are met with on this length, and, as a consequence, very many obstacles have had to be considered and overcome in designing satisfactory equipments.

Another difficulty in connection with the low bridges at Victoria station, which has been a serious obstacle, is that the train crews have to work upon the roofs of trains in the terminal stations, and consequently the overhead conductor had to be placed at a height of 21 feet, rendering it necessary to design a special form of current collector bow capable of working satisfactorily at high speeds through a range of between 21 feet and 14 feet, giving a vertical movement of seven feet, and this has been by no means an easy task.

SPECIFICATIONS FOR "WIRELESS"

The Great Lakes Radio Telephone Company of Cleveland, through Mr. H. D. Crawford, assistant superintendent, announces the following specifications for wireless telephone towers and poles required. The company says that it is building wireless telephone stations at Buffalo, Cleveland, Detroit, Toledo, Port Huron, the "Soo," Duluth, Milwaukee and Grand Haven:

(a) Tower of galvanized steel, 80 feet high, designed to support a 60-foot pole, which is to extend 40 feet above top of tower. The pole is to be not more than 12 inches in diameter for the first 20 feet, then tapered to about four inches at top. The steel structure is to be built with a safety factor of 6 and to have a spread at base of at least 12 feet from center to center of plates. The tower should be fitted with a heavy steel support, to receive the pole, and provided with a cap piece at the apex having a hole for the wooden pole.

(b) Tower 100 feet high, to carry a 40-foot wood pole, extending 20 feet above the top of the tower, safety factor 5. Prices quoted should contemplate erection of poles on building in city designated on Great Lakes, including opening the roof, guying, etc.

(c) Tower 230 feet high to support a 40-foot pole extending 20 feet above top of tower, safety factor 6. Price to cover erection on the ground, including concrete foundation, and guying four ways.

Quotations on the steel parts of the above towers without poles, f. o. b. factory, are also desired. The company announces that the first order will probably be for 10 class (a), five class (b) and three class (c) towers, but prices should be for single towers.

TRANSFORMERS FOR SALT RIVER PROJECT

An initial shipment of water-cooled power transformers, forming part of an ultimate equipment of 36 transformers, aggregating 10,530 kilowatts, for the United States Reclamation Service in connection with the Salt River (Arizona) irrigation project, has recently been made by the Wagner Electric Manufacturing Company. The contract was awarded to the Wagner Company under severe requirements as to insulation, operating characteristics, etc., and also under rigid stipulations as to prompt delivery. The recent shipment comprises six 350-kilowatt, 25-cycle, 2,300-26,000-volt step-up transformers and nine 235-kilowatt, 25-cycle, 23,100-1,100-volt step-down transformers. The design of the transformers required dealing with certain special conditions at the places of installation, among which were the limited space for handling the transformers in the power house and the high temperature of the cooling water, due to the hot climate of the desert region. The water is circulated through the cooling coil of each transformer by a Wagner three-phase motor-driven triplex pump.

LIGHTING LINCOLN PARK

The Lincoln Park commissioners are changing the system of lighting Lincoln Park, Chicago's noted North Side recreation ground, to utilize current obtained from the Drainage Canal plant of the Sanitary District. About a thousand series alternating-current arc lamps will be used ultimately to replace the present direct-current lamps, and the contract for 475 of the new lamps, the initial installment, has been awarded to the Western Electric Company. The park commissioners will cease to generate current when the change is made, and the Fort Wayne Electric Works has the contract for an elaborate $12,000 switchboard, from which the various circuits will be controlled. Sargent & Lundy are the engineers.

QUESTIONS AND ANSWERS

POWER-PLANT LOSSES AND CHANGES

F. S. R., Keithsburg, Ill.: 1. We have a 150-horsepower Corliss engine belted to a 120-kilowatt, 125-cycle, 1,000-volt alternator by an 18-inch double leather belt. How much power would we have saved if we had installed a 60-kilowatt dynamo with a 12-inch belt? 2. Are there any books published that will tell us how to find the losses in engines, dynamos and belts? 3. If we should change our system from 125 cycles to 60 cycles would it be necessary to change all of our transformers? Why?

Answers.

1. This question is not entirely clear. The impression it gives is that the 120-kilowatt generator is usually running at only about one-half load or less, so that a 60-kilowatt generator could have carried the entire load without trouble. The saving that might have been effected under such conditions would be the difference between the efficiency of the larger generator at one-half load and the efficiency of the smaller one at full load, i. e., about 4 to 5 per cent. in favor of the latter which amounts to 2.5 to 3.0 kilowatts.

2. While there is no book known to us that deals exclusively with this subject, practically all of the standard electrical engineers' pocket books and books on electrical power plants devote some space to the testing of engines, generators, etc., and calculation of their efficiences and losses.

3. To get the highest efficiency and best regulation for the system it would be desirable to change all the transformers to the type designed for 60-cycle circuits. However, the gain in efficiency on the small transformers will be inconsiderable compared to the cost of the new equipment, and therefore it will be advisable to change the large transformers only.

AMPERE-HOUR AND AMPERE-HOUR METER

D. T. B., St. Paul, Minn.: What is an ampere-hour? Has it any relation to a watt-hour? What is an ampere-hour meter?

Answers.

An ampere-hour is the quantity of electricity that has passed in a circuit in one hour when the current has been steadily one ampere. The total quantity of electricity passed in a circuit by a constant current in a given time is obtained by multiplying the current in amperes by the time expressed in hours; the product is the quantity in ampere-hours, and is independent of the voltage of the circuit. The discharge capacity of storage batteries is commonly expressed in ampere-hours. Thus, a battery that can discharge 50 amperes steadily for eight hours has a capacity of 400 ampere-hours.

If the number of ampere-hours delivered to or by any electrical apparatus or circuit is multiplied by the voltage at its terminals, the product is the watt-hours or electrical energy consumed in or developed by the apparatus or circuit. This is on the assumption that the voltage has remained constant or that its average effective value is used. The consumers' meters in this country usually measure the watt-hours or true energy consumed. An instrument that measures the ampere-hours is an ampere-hour meter. If the voltage has been constant, the reading of an ampere-hour meter multiplied by this voltage gives the actual energy in watt-hours. Ampere-hour meters are usually either of the electrolytic or of the mercury motor-meter type. They are quite extensively used in Europe.

EQUIVALENT SPARK GAP

F. T. E., Chicago: What is the equivalent spark gap and how is it found?

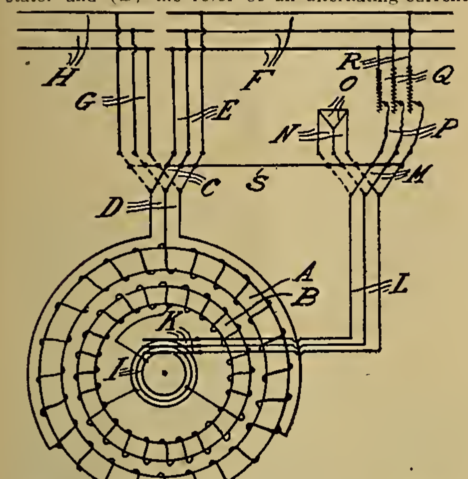
Answer.

The term "equivalent spark gap" is used in connection with lightning arresters and is that length of air gap between definite terminal points placed in parallel with the arrester which offers substantially the same resistance to a static discharge that the arrester itself does. This spark gap should be measured between needle points of definite sharpness, the length between which is accurately adjustable by means of a micrometer screw.

A HIGH-SPEED ALTERNATOR FOR CIRCUITS OF DIFFERENT FREQUENCY

A patent was recently granted to Carl A. Lohr of Wilkinsburg, Pa., on an invention of an alternating-current generator capable of operating at two frequencies with the same speed. It is particularly applicable to generators that are directly connected to high-speed prime movers, such as steam turbines. With a frequency of 25 cycles per second, for instance, the highest available speed which can be used in alternating-current generators of the ordinary construction is limited to 1,500 revolutions per minute, while with a generator of the construction herein described the generator and prime mover can be run at exactly twice the speed which, aside from a number of electrical advantages, is of advantage mainly on account of the better utilization of the steam turbine. In addition, this generator may be alternately switched over from one alternating-current line to another of different frequency.

In the accompanying drawing (A) represents the stator and (B) the rotor of an alternating-current



HIGH-SPEED GENERATOR FOR TWO FREQUENCIES

generator. Both parts are shown in the drawing as having three-phase windings. The windings of the stator are connected by the triple-pole, double-throw switch (C), when thrown as shown by the full-drawn position, by the conductors (D) and (E), with an alternating-current line (F). Furthermore, these windings can be connected, when switch (C) is thrown as shown in the dotted position, by means of the conductors (D) and (G) with another alternating-current line (H), of different frequency.

The windings of the rotor can be connected over the collector rings (I), brushes (K), conductors (L), the triple-pole, double-throw switch (M), when thrown as shown by the dotted position, and the conductors (N) with the resistances or short-circuiting conductors (O). The rotor can be connected also, when the switch (M) is thrown as shown by the full drawn position, through conductors (P), regulating resistances (Q) and conductors (R) with the line (F).

These switches are simultaneously operated and may be mechanically connected as indicated by the line (S). Thus it will be seen that by a single switch throw the generator may be connected alternately with stator and rotor to the line (F), or only with the stator to the line (H), the rotor being then closed upon itself. When the switches are thrown as shown in their dotted positions, the generator will act as asynchronous induction generator to the line (H), and when the switches are thrown as shown in their full drawn position the generator will act as synchronous induction generator to the line (F). In order to secure a successful operation of this generator with both the lines, the frequency of line (F) must be over one-half of the frequency of line (H).

Supposing the frequency of the line (F) to be 15 cycles per second, which frequency, the inventor thinks, will be largely used in the near future for alternating-current railway work, the number of poles of the generators to be two, as shown in the drawing, and the switches to be thrown as shown in the full-drawn position, the generator will supply electric energy to the line (F) when driven at a speed of 1,800 rotations per minute. With the same speed, when the switches are thrown as shown dotted, so as to connect the stator with the line (H) and so as to close the rotor upon itself, the generator will supply energy to the line (H), when the frequency of this line is such as to produce in the stator a magnetic rotary field rotating with a speed less than 1,800 rotations per minute. Obviously the frequency of the line (H) must then be less than 30 cycles per second. Both alternating-current lines must be supplied by other generators, as the generator here described must be excited by alternating currents of the proper frequency. Thus this generator is particularly well suited to act as additional generator to a system of two alternating-current lines and may be easily switched over from one line to the other by a single switch throw, without changing the speed of the prime mover.

A special case in which the alternate working on lines of different frequency is of importance may be illustrated in the following example: Supposing a power station comprises a group of alternating-current generators which supply a line of 15 cycles per second for railway work, and a second group of alternating-current generators, which supply a line of a frequency between 25 and 30 cycles per second for supplying incandescent lamps or other translating devices. The generators of the ordinary construction could not under retention of the same speed as required by the prime mover, be shifted onto a line of different frequency, and it is therefore necessary that either group of generators must be sufficient for the full load of the line which it supplies. Experience has shown that the maximum loads of two such lines are never reached at the same time, and it is therefore readily discernible that one or more generators may be dispensed with when generators of the system here described are used, as these permit, without change of speed, alternate working to that line which is carrying the heavier load. This generator of the synchronous (double-connected) type works best to a line of lower frequency, while as a generator of the asynchronous (single-connected) type to a line of higher frequency.

In case a lower voltage is desired for the rotor when connected to the line (F), or, what is more important, in case a lower resistance is required when the rotor is acting as short-circuited member, a transformer (not shown) must be interposed in the conductors (R) leading to the line (F). This transformer may be Y-connected.

The regulating resistances (Q) serve to equalize the rotary fields in the stator and rotor when both members are connected to the line (F). The purpose of these resistances is to avoid cross-currents flowing between the windings of stator and rotor. The connection of the rotor over a transformer would result in a lower resistance of the rotor windings, and therefore require a less slip over synchronism for a given output as asynchronous induction generator. The arrangement with or without a transformer in the connections to the rotor has therefore an influence on the ratio of frequencies of the two alternating-current lines.

In the case mentioned, having a generator speed of 1,800 rotations per minute and a frequency of 15 cycles per second in the line (F), the frequency of the line (H) must be less than 30 cycles per second. If the frequency of this line be 25 cycles, the rotor resistance must be higher, if the frequency of this line be 29 or almost 30 cycles, the rotor resistance must be lower in order to secure a satisfactory working of the generator to both lines, and especially in order to secure a desired output of the generator when supplying line (H). Thus it will be seen that in the combination as described a transformer is necessary for certain conditions.

The United States Civil Service, Commission, Washington, D. C., announces an examination on September 16th at the principal cities in the country to secure eligibles from which to make certification to fill a vacancy in the position of writer of specifications and computer at $1,200 per annum in the office of the quartermaster-general, War Department, Washington, D. C., and vacancies requiring similar qualifications as they may occur in any branch of the service.

OBITUARY

F. A. BAUX

Felician Albert Baux, well known in the earlier days of the electrical business in Chicago, died at the Mercy Hospital in this city on July 29th of uræmic poisoning. Mr. Baux had been in poor health for some time and was removed to the hospital on July 17th, although no serious results of his ailment were at that time expected. However, he grew worse and was unconscious for 24 hours preceding the end, which came at 5 o'clock on Wednesday evening.

Mr. Baux was born in Besancon, Doubs, France, 60 years ago. When he was 10 years old his family emigrated to America and sought their fortunes in the mines of California. The son received his preliminary training in the parochial schools there and was later graduated from Union College, New York.

As western manager he represented the Mather Electric Company (now extinct) for a number of years in Chicago. At the time of his death he had offices in the Monadnock Building, where he conducted a general business of selling electric power plant and railway machinery.

Mr. Baux was a man of unusual intellect and culture. To the extent of his means he was a cheerful though retiring philanthropist. He was much interested in the work of the Roman Catholic Church, of which he was a devout member. Though he left few close friends, his passing will be noted with regret by a large number of acquaintances, particularly among the older men in the electrical industry. No relatives are known to be alive in this country.

The interment took place at Mount Olivet Cemetery, Chicago, on the afternoon of Friday, July 31st.

J. V. S. CHURCH

Joseph V. S. Church of Chicago, western advertising manager for the Electrical World of New York, died suddenly on July 29th. Mr. Church reached his home on Dover Street after the day's work at the usual hour on Tuesday evening of last week. He seemed to be in excellent spirits and went out to post some letters. Returning, he complained of a severe headache, and very soon became so ill that he was put to bed, where he speedily lost consciousness. Doctors and a nurse were hurriedly summoned, but the stricken man never recovered consciousness and died at 8:30 a. m. on the following morning. Apoplexy superinduced by heat was the cause of death. The funeral was held on July 31st and was private. Burial was in Graceland Cemetery.

Mr. Church was 45 years old. He had been connected with the Chicago office of the Electrical World since 1895 and had a wide acquaintance among electrical men. Mr. Church was a man of strong personality, a salesman of pronounced ability, a fluent conversationalist and a man whose society was prized by his intimates. Withal he was good-hearted and would do much to oblige a friend. He was born in England and is survived by his wife, Olive E. Church.

OTHER DEATHS

Edgar Parker, assistant manager of the Mankato Electric Traction Company, recently succumbed to typhoid fever at Mankato, Minn.

Captain Nathaniel F. Edwards of Appleton, Wis., one of the builders of the electric car lines in that city, recently died at the age of 71.

Thomas J. Gargan, member of the Boston Rapid Transit Commission, died on July 30th in Berlin, Germany, as the result of a surgical operation performed there in an attempt to relieve him of an intestinal trouble. He was one of the best-known citizens of Boston, and a lawyer by profession.

H. G. Shaler, secretary of the Doubleday-Hill Electric Company of Pittsburg, died in that city on July 18th. Mr. Shaler was a native of Pittsburg and was well known in electrical circles. He was a man of upright character and generous nature and will be mourned by many friends and acquaintances. He is survived by his widow and two children.

Work is progressing rapidly in the restoration of the destroyed portion of the electrical plant at Cazadero, Ore., entailing a loss of $116,000.

ILLUMINATION OF A LARGE OFFICE

Office lighting is rightly regarded as one of the difficult problems in illumination. Bookkeeping requires close application and demands such constant service of the eyes that office men are notoriously sensitive to the lighting conditions. Especially is this true in a large office where many employes are grouped together. Architects are giving more and more thought to the provision of suitable day illumination, while the demand for improvement in artificial illumination is even more imperative.

The simplest and most common method of office lighting is to provide small individual units in the form of desk or drop lights. In many cases this is the best available form of illumination, especially when the working illumination is required only at isolated points. Perhaps the most serious fault to which this method of illumination is commonly subject is the glare of the lamps themselves or of the light reflected from desks or papers.

It is not unusual on entering an office to find the fixtures draped with all kinds of shades and provided with the highest power lamps obtainable. This is an indication of unsatisfactory illumination. Unfortunately, instead of improving the illumination the experiments generally result in increased glare and consequently increased eye-strain.

A more modern office lighting is by general illumination, produced by larger units installed near the ceiling, and so arranged as to give even illumination. Where work is sufficiently concentrated this method of illumination is cheaper to install and operate. A fine appearing installation can be produced which will not clutter up the room and will not suggest interference on the part of the employes.

In making such an installation it is advisable to use considerable care in selecting the unit so as to produce a satisfactory result. The light source should be of low intrinsic brilliancy, with a relatively large diffusing surface, in order to avoid glare and dense contrasty shadows. The lamp should be economical to operate and should distribute the light so as to produce an approximately even intensity of illumination in all parts of the room.

The capacity of the unit should be as large as possible, consistent with an even distribution. In a large room with a high ceiling a relatively large unit may be used. A number of different arc and incandescent-lamp combinations are available for this class of lighting. The equipment most suitable for a particular case frequently depends upon local conditions.

A representative installation in which an excellent illumination is produced by means of the ceiling diffuser arc-lighting system is in the offices of the Stanley Works, manufacturer of builders' hardware, at New Britain, Conn. This company completed a new office building a year ago. The artificial lighting of the large general office was planned by the illuminating engineering department of the General Electric Company in co-operation with the architects and the purchasing department of the Stanley Works.

The room in question has a 22-foot stud. The working area is 82 by 75 feet and is lighted by means of 24 six-ampere direct-current enclosed arc lamps, with the recessed type of ceiling diffusers, consuming 15.8 kilowatts.

The lighting has been in use throughout the dark winter months and has given entire satisfaction to both the company and the employes. The excellent illumination of the office, both by daylight and artificial light, is illustrated by the accompanying photographs, which were made under the regular lighting conditions without flashlight or any special treatment.

Daylight View

Artificial Lighting

ILLUMINATION OF A LARGE OFFICE

COMMUNICATION

MORE THAN 57 VARIETIES

To the Editor of the Western Electrician:

The island now known as Manhattan has had at various times 46 different names applied to it, ranging from Manetto and Manath to Munhaddons. The town of Ampere, N. J., is often called out of its name in spite of the natural simplicity of the word. Ampere is named after the celebrated French scientist, whose name is also used throughout the world as the unit of electrical current. Letters addressed to Ampere (which, by the way, is the only place in existence so named) have borne the following words: Amfere, Amphion, Amperre, Ampore, Ampee, Amperr, Ampre, Ampire, Ampier, Ampiere, Ampsere, Ampero, Amperc, Ampen, Ambere, Amerer, Ampeal, Ampeare, Amphere, Amphen, Ampicre, Auspere, Ampeere, Ampers, Amperel, Ampeu, Monpere, Onyiere.

The town was named Ampere by the Crocker-Wheeler Company, manufacturer of electrical machinery. The name of the company has been variously written as follows: Corcker-Wheeler Company, Crocker-Wheeler Company, Crocker-Wheeler Company, Crocker Water Motor Company, Croaker & Wheeler, Crocker-Wheeling Co., Crocker-Wheelwe Electric Co., Crocker-Wheel Co., Crocker-Wheeler Electric Co., Booker Wheeler Co., Brocker Wheeler Co., Crockett-Wheeler Co., Chrocker-Wheeler Co., Clocker Wheeler, Cricker-Wheeler Co., Rocker-Wheeler Co., Croker & Wilson Gas Engine Co., Croker & Wheeler Co., Croier Wheeler Elec. Co., Crocker-Wheeles Co., Croker Willer Dynamo Co., Croper & Weeler Co., Croker-Wheeler Co., Croquer-Wheeler Company, Crocker-Whaler Motor Co., Crocker-Wheelef Company, Wicker & Wheeler, Vrocker Wheeler Co., Wheeler & Crocke, Crocker-Williams Co. RODMAN GILDER.

Ampere, N. J., July 29, 1908.

UNIQUE TELEPHONE ADVERTISING

The National Telephone Company recently executed a novel "stunt" in advertising its "secret service" party-line system at Steubenville, Ohio. Eight telephones were connected up on a single board on the rear of a large surrey. The telephones were equipped with ordinary call-bells, each sounding a separate note in an octave. The eight bells symbolized eight different subscribers who can be called separately on a party line. The parade of the city streets with this unique musical contrivance attracted much attention.

The strike of employes of the Elgin-Belvidere Electric Company, operating an interurban electric railway between Elgin and Belvidere, Ill., has been settled. The men sought higher wages, which the company finally granted. On July 30th traffic was fully resumed.

LARGE BUCKEYE FOUR-STROKE-CYCLE GAS ENGINES

In the years 1896 and 1897 the Buckeye Engine Company of Salem, Ohio, began a searching investigation into the merits of internal-combustion engines. It was the company's belief that the time was near when there would be a large demand, in medium and large powers, for this class of prime mover, provided such an engine could be built without too many complications and approaching the steam engine in reliability.

In 1897 for experimental purposes the company built a four-stroke-cycle double-acting tandem engine of 125 brake horsepower, and this engine was exceedingly promising in its operation. But the company did not push its introduction owing to the fact that business in Buckeye steam engines had increased to such an extent as to completely absorb all factory facilities.

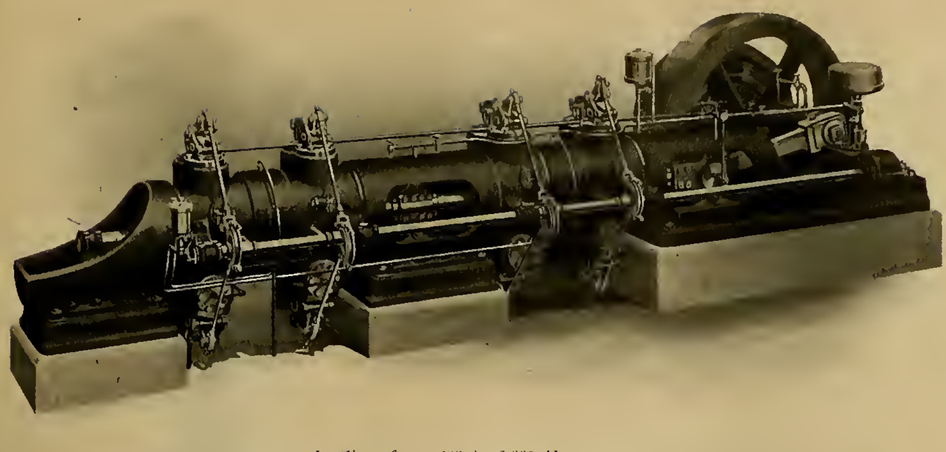
During the present year, however, extensions to the Buckeye factory at Salem have been completed and factory facilities increased by the additions of buildings and modern machinery to the extent that the company is now placing on the market medium and large internal-combustion engines for all classes of work.

During the development the Buckeye engineering department perfected the two-stroke and four-stroke cycle engines, types of which are illustrated herewith. Fig. 1 is a clear view of the Buckeye four-stroke-cycle double-acting tandem internal combustion engine, while Fig. 2 shows the Buckeye four-stroke-cycle single-acting tandem engine of the same class.

Utility and simplicity are the characteristics of these gas engines. The Buckeye company became convinced that the proper type of cylinder construction for a double-acting horizontal engine is that shown in Fig. 1, page 103.

This construction, with admission valves on the top and exhaust valves on the bottom of the cylinder, allows ready drainage of the oil and other deposits directly through the exhaust valves. Furthermore, it has been found best to have the exhaust and admission valves widely separated, for the reason that where both valves open into the same space, the fresh charge, entering the cylinder through the chamber surrounding the exhaust valve, is heated and largely expanded, thus decreasing the weight of the charge and reducing the power of the engine. In large sizes the cylinders are made in halves, bolted together in the center, but in small sizes they are made in one casting. Owing to the difficulty of maintaining perfect alignment and the recognized weakness of center-crank-type shafts, the Buckeye company builds its engines of the side-crank construction.

It is well known that the gas and air should be thoroughly mixed before combustion takes place, in order to attain a high combustion efficiency. The ideally perfect conditions of combustion in the explosive type of internal-combustion engine would require the flame to be propagated instantaneously throughout the whole combustion chamber, and that the chemical reaction should be instantaneous and complete. In practice it is found that the best thermal economy is obtained when the firing line on the indicator diagram slopes about five degrees forward. The reason for this is that operating in this way, the heat due to combustion is rapidly absorbed as work on the piston itself, while if the combustion is complete while the piston is on the dead center there is more time for the heat of combustion to be lost by conduction into the jacket water. An



In Sizes from 200 to 6,000 Horsepower
FIG. 1. BUCKEYE FOUR-STROKE-CYCLE DOUBLE-ACTING TANDEM GAS ENGINE

indicator diagram illustrating the best operating conditions is shown in Fig. 3.

The amount of compression within certain limits in an internal combustion engine, other things being equal, determines the thermal efficiency of the engine. Some engines have sufficient compression when running at maximum load, but when the load decreases the compression drops, thereby greatly decreasing the thermal efficiency at light loads. In the Buckeye gas engine the compression is nearly uniform from maximum load to about one-fourth load. From about one-fourth of the full load down to purely friction load the ingoing charges are slightly throttled. In other words, the mixing apparatus is a combination of quantitative and qualitative control. All valves are of the "poppet" and "butterfly" type.

The mixing apparatus is constructed to give a complete intermingling of the gas and air just before the supply passes into the cylinder. The engine is supplied with a complete mixing apparatus for each combustion chamber. There is a gas valve in each mixing chamber which shuts off the gas completely except during the period when its corresponding combustion chamber is being charged. This prevents surging and fluctuation of mixtures through the piping system of the engine, except to the extent which the governor automatically determines.

The engines are designed to be operated with either the jump or make-and-break spark. All double-acting engines are provided with two or more igniters in each combustion chamber, and if desired can be operated with both high and low-tension ignition simultaneously.

The Buckeye timer is provided with the following adjustments: First, automatic control directly by the governor, depending upon the power developed during any instant; second, hand adjustment of all igniters simultaneously; third, hand adjustment of each igniter independently while the engine is running.

The diagram in Fig. 4 shows the results obtained by this system of ignition. It will be observed that all the diagrams in this cut are nearly vertical on the firing end at all gradations of load from friction to maximum.

Fig. 5 shows a diagram taken from an engine at normal speed during the advancement of ignition until the firing was too early, and later retarding until, as can be seen from the figure, the ignition occurred too late. This diagram is shown to illus-

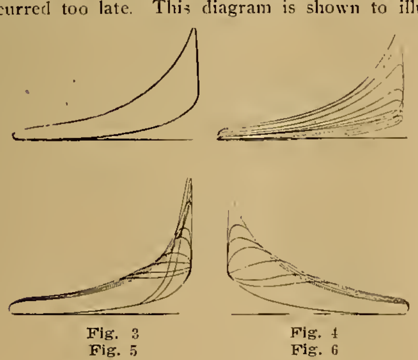


Fig. 3 Fig. 4
Fig. 5 Fig. 6

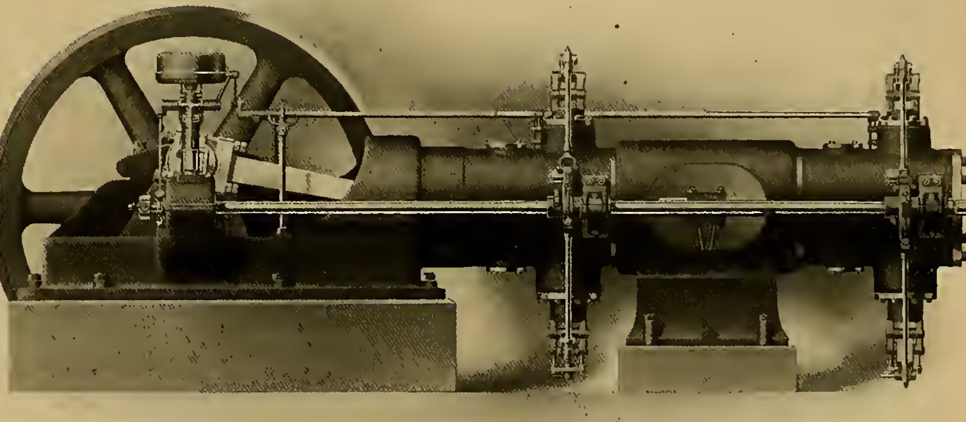
GAS-ENGINE INDICATOR DIAGRAMS

trate how easily the igniters are adjusted while the engine is in operation. This timer is exceedingly simple and durable.

There is a prevailing belief that the speed regulation of gas engines cannot be as closely maintained as on high-class steam engines. But it is asserted that the regulating system on Buckeye engines is so effective that they are adapted for any class of installation where close regulation is required.

Since the company water-jackets the exhaust valves in all these engines from smallest to largest, and the piston heads and rods in all above 11-inch diameter of cylinder, it is able to maintain as high compression is as practicable under commercial conditions. The Buckeye gas engine is as noiseless as a well-constructed modern steam engine. The valve gear employed to lift and seat the valves operates so well that practically all noise is eliminated.

Relative to the overload capacity of engines, direct-connected to electric generators, the manufacturer remarks that in gas-engine practice it is customary to allow from 15 to 25 per cent. for continuous overload capacity of the engine and generator combined. The Buckeye four-stroke-cycle engines are so rated that 10 per cent. overload may be carried continuously; that is, an engine rated



In Sizes from 50 to 300 Horsepower
FIG. 2. BUCKEYE FOUR-STROKE-CYCLE SINGLE-ACTING TANDEM GAS ENGINE

at 100 brake horsepower will develop 110 brake horsepower.

The bed-plate is of the bored guide type, plain and massive in construction. The crosshead is a steel casting, threaded to receive the piston rod. The "shoes" are steel castings and have a swivel connection to the body of the crosshead, and are adjusted for wear by eccentric bolts.

The advantage of swivel crosshead shoes in this type of engine will be apparent. On a horizontal engine with a comparatively long piston rod, supporting a heavy piston, it is inevitable that the rod should bend slightly in the form of a bow. Without swivel shoes in the crosshead this deflection tends to make the shoes bear on one end and causes heating of both slides and shoes. In Buckeye engines this does not take place, and no matter how much flexure there is in the piston rods, the crosshead shoes have a full bearing.

The intermediate crosshead has the same swivel-shoe connection as the main crosshead, and also serves as a clamping nut to connect the two sections of the piston rod.

The tail-rod crosshead has the same adjustment as the other crossheads.

The pistons are "floated" in the cylinders, or, in other words, are made appreciably smaller than the working barrel and are carried entirely by the crossheads. This insures a uniform and circular bore of the working barrel indefinitely. A number of packing rings are employed in each piston because many rings under slight tension are more serviceable than fewer rings subjected to higher tension.

On the double-acting tandem engines the piston rods are made in two sections and joined together by means of the intermediate crosshead, which, as above stated, is clamped and threaded. Each piston rod is drilled through from end to end and is ground true on the outside.

The exhaust valves are of the poppet type, water cooled internally. Each pair of admission and exhaust valves is driven by a single eccentric. The operation of this valve gear is noiseless at all speeds.

In the design of these engines the company considered accessibility for assembling and dismantling of the utmost importance, deciding questions of design from the standpoint of the operating engineer. For instance, all valves are removable without interfering with any piping. For the purpose of inspection, too, large engines are provided with mechanical appliances for handling the exhaust valves. In order to clean and inspect the combustion chamber, it is only necessary to remove either the admission or exhaust valves, or any one of the heads can be unbolted and slid on the rod, exposing the whole end of the cylinder.

The governor is mounted directly on the gear box between the lay shaft and the main crank, and, being driven by the drag shaft, removes the fault to be found where it is driven by the lay shaft, since, if driven by the lay shaft, it is subjected to the torsional disturbance caused by the operation of the valves. The construction is such that any combination of length and diameter of spring may be used to suit conditions. This governor is of the high-speed type and very sensitive. Each cylinder, cylinder head, exhaust bonnet and exhaust valve is cooled and has its own independent water circulation. This admits carrying as high compression as possible under commercial conditions, with the consequent high thermal efficiency, etc. All Buckeye engines are furnished with a well-constructed indicator rig. The rig at the same time serves to convey oil to the crosshead pin.

These engines are started by means of compressed air. The starting valves operate automatically until the engine begins to fire, when the air is automatically shut off.

The company builds a combined gas engine and air compressor for furnishing the necessary amount of compressed air for starting purposes. This machine is of simple design and can be operated on any kind of fuel, such as gasoline, natural, artificial or producer gas.

Fig. 4 represents actual indicator diagrams showing perfection of development at all loads, from purely friction to maximum. It will be noticed by examining these diagrams that the compression is practically constant for all loads except the very lowest. It will also be observed that the firing line on the diagrams, from purely friction to maximum load, is as effective as it could be to obtain the best results.

Fig. 6 is a reproduction of diagrams taken from an engine running under a considerable fluctuation of load, but with no change in the timing of the ignition. It is seen that if the timer is adjusted for correct ignition at maximum load, it occurs too late at the lower loads. This is very poor economy, showing deficient functioning; engines which operate under such conditions are wasteful in the utilization of fuel.

On account of its uniform turning effort, the double-acting tandem engine is especially well adapted to direct-connected generator work.

Engines of the type shown in Fig. 1 are built in sizes from 200 to 6,000 horsepower, while the type illustrated by Fig. 2 can be furnished in sizes from 50 to 300 horsepower.

IMPURITIES IN COAL

Prof. N. W. Lord of Columbus, Ohio, chief chemist of the Technologic Branch of the United States Geological Survey, delivered an address on "The Fuels of the United States" before the annual convention of smoke inspectors at Cleveland on June 24th. He confined his remarks to coal. Following are extracts from the address:

"As is well known, coals differ widely not only in their physical characteristics and their behavior under a destructive distillation (some cementing together into a hard coke or possessing the coking property, as it is termed; others, the so-called dry coals, showing but little or none of this quality), but also in their chemical composition and in their associated impurities.

The coal from any district or mine may be considered as made up of coal proper and a certain amount of mechanically held impurities, consisting of ash, moisture and sulphur in the form of pyrites. One of the results of the investigation of the fuels of the country has been to show that the character of the coal proper is much less subject to variation in the mines of a given seam in a given district than are the relative proportions of the impurities, particularly ash and sulphur, which vary greatly in different portions of the same seam and frequently vary considerably from one portion of a field to the other.

Worthless admixtures reduce in proportion to their amount the heating value of the coal of which they form a part. Sulphur cannot strictly be regarded in this light, as it stands for a heating value of its own equal to approximately half of the coal that it replaces.

Moisture, on the contrary, not only reduces the heating value of the coal as a diluent but absorbs appreciable quantities of heat in its evaporation. Its presence in the coal bears unquestionably a relation of some importance to the nature of the combustion, and probably bears to some extent on the problems of smoke consumption, as it is probable that moisture in the gas of a furnace has a certain power of facilitating the completeness of combustion.

In addition to the effect of these materials as diluents, their positively injurious characters must be considered in many operations, as that of sulphur in the manufacture of iron and gas and the clinkering power of ash in obstructing drafts and leading to increased cost and diminished efficiency in the handling of the fuel.

It is very difficult to state in dollars and cents the relative importance of these impurities, but under the recent system of coal purchased by the government a fairly satisfactory system of figuring coal on analysis with reference to its impurities has been put into successful operation, an interesting account of which is given in a recent bulletin of the United States Geological Survey on "The Purchase of Coal Under Government and Commercial Specifications on the basis of Its Heating Value," by Mr. D. T. Randall of the fuel testing branch.

It is hoped that a publication can be brought out soon in which all the analytical work done in the government testing plant up to July of the current year will be collected together and classified according to districts and seams. The manuscript of this work is now largely prepared, I understand. The analyses published give illustrative determinations on almost every important coal district in the United States, and, properly used, will enable coal users to arrive at very satisfactory conclusions in regard to the properties of any coal on the market.

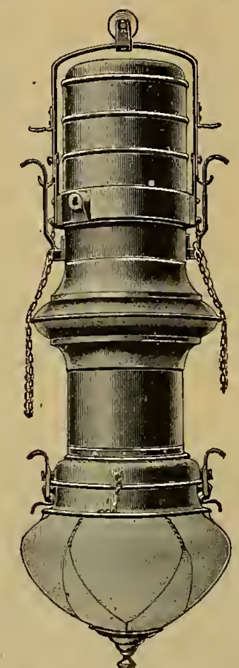
Of particular interest to the Association for the Prevention of Smoke are the variations in the different coals in the nature and character of the volatile matter given off on heating. It is well known that different coals differ in their smoke-producing tendencies. Within the last two years a series of important investigations on the destructive distillation of coal has been carried on by Dr. H. C. Porter in the laboratory of the Technologic Branch of the United States Geological Survey, in which it has been shown that coals differ very considerably in the nature of the volatile products distilled at low temperatures and in the early stages of heating. These differences correspond to different degrees of combustibility in the liberated gases. The work has also shown differences in the rate at which these volatile materials are expelled from different coals and also in the percentage of inert or non-combustible material present in the gases evolved. Time has not permitted the extension of these investigations to more than a few typical coals, but the results so far obtained indicate that the investigations will prove of great value to the engineer in solving the important problems of specializing furnace design to burn with the greatest advantage and with the least production of smoke particular types and classes of coals. The results will probably also be valuable in the important study of the details of methods of firing and handling the coals with reference to the nature and combustibility of the volatile material.

"STAVELCO" ARC LAMPS

Mr. Theodore Stave, who is reported to have been remarkably successful in popularizing the flaming arc lamp in Europe, has now made his headquarters in this country. He is president of the Stave Electrical Company of 1 Madison Avenue, New York city, which makes arc lamps of various types, including the flaming arc and semi-enclosed lamps illustrated herewith.

The principle of the flame lamp is not new. As far back as 1879 successful experiments were made with this type of lamp in France, but at that time the difficulty in the production of suitable carbons prevented the general adoption. In the last five years great impetus has been given to the flame lamps through the appearance on the market of satisfactory carbons.

In the "Stavelco" flame lamps the mechanism of the lamp is in an entirely distinct sealed compartment.



STAVELCO FLAMING ARC LAMP

The alternating-current lamp is of the well-known motor type; that is, the control of the lamp is attained by an aluminum disk rotating in either direction according to the strength of the flux in either the series magnet or shunt magnet. The control is ideal, as three rotations of the disk only correspond to a feed of one-sixteenth of an inch. The fact that the alternating flame lamp is almost as efficient as the direct-current for the same amount of current should be an extra inducement for alternating-current users, as ordinary arc lamps are very much less efficient on alternating current than on direct current. Like the direct-current lamp, an unlimited amount of lamps may be burned in series, each lamp automatically taking care of its proper voltage.

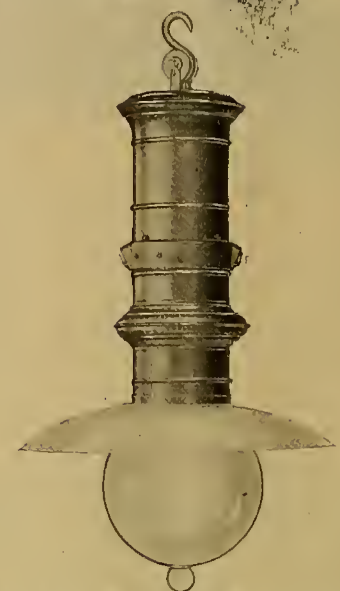
It has been realized that a lamp must work equally well on either two in series on 110 volts or 10 in series on 500 volts. This can only be obtained by a well-proportioned and well-calculated differential winding of the feed mechanism. It has been the constant aim to construct the lamp in such a way that there is no need of readjusting the lamp for a certain circuit, but any desired number of lamps can be put up on voltage ranging from 110 to 5,000 without any readjustment. Every lamp will simply burn at the proper voltage, namely, 45 volts, and as soon as this voltage, by reason of the natural consumption of the current, is increased to 46 or 47 the feeding mechanism comes in operation. Each lamp contains an internal resistance, so adjusted that the lamp is ready for immediate use on 115-volt circuits; that is, two burning in series.

The whole bottom part of the lamp is made of cast-iron and steatite guides, the latter being arranged an inch or two above the arc, and thus avoiding the splitting or cracking of same through excessive heat.

All the necessary flexibles are made by very fine stranded copper wire threaded with glass beads. This has proved to be the best class of insulation obtainable, as the glass is impervious to the fumes, and every individual bead automatically cleans the next one through constantly changing its position.

Much attention has been paid to the construction of the carbon holders, as it has been found that the screws easily break off. A substantial and easily accessible thumb-screw has been provided for this purpose, thus not tempting the trimmer of the lamp to use his pliers and so break off the screw. The lamp is finished in brass, copper or nickel.

In the "Stavelco" semi-enclosed arc lamp a certain amount of oxygen is allowed to burn with the



STAVELCO SEMI-ENCLOSED ARC LAMP

arc. This adds to the luminosity of the lamp and eliminates the ultra-violet rays which are so trying to the human eye. In fact, the light emitted by this lamp is almost perfectly white, and therefore desirable for department stores and any business where colors have to be discerned by artificial light. The mechanism of this lamp is of the simplest construction and of the clutch-feed principle. A feature which has been carefully studied is the facility of trimming the lamp. All that is required is to push the carbon as high against the roof of the lamp as it will go. The carbon guide is split at the lower end, so that the carbon holder is easily accessible for inspection. The life of the lamp is between 28 and 30 hours, and the carbons used are very small—six millimeters, or less than a quarter of an inch in diameter. The crater of the arc is thus confined to a very small point on the carbon and there is little tendency for this crater to travel on the outer edge of the carbons. The efficiency of the lamp is said to be high. With a current consumption of four amperes, 800 mean hemispherical candlepower is obtained. The lamps may be connected in multiple on 110-volt circuits or in series on 220-volt supply. They are made for either direct current or alternating current, and in the latter case for any frequency from 40 cycles to 125 cycles.

BOOK TABLE

On the Canal Zone. By Thomas Graham Grier. Chicago: Press of Wagner & Hanson Company. 1908. Pp. (6 by 9 inches), 150, with 172 illustrations and map of the Isthmus. Price, cloth, $1.

To the average wide-awake American, who wants to know all about the Panama Canal—what is being done, what has been done and what manner of men are doing it, as well as the general lay of the land thereabouts—there can be no hesitancy in recommending Mr. Grier's book, "On the Canal Zone." The author himself—a well-known electrical man of Chicago—belongs to the class first mentioned above and he has brought back from his tropical trip a surprising quantity of interesting information and photographs and packed them into an attractive book.

The trip to the Isthmus is told in the form of a diary, and the rest of the book is divided into chapters giving accounts of the chief cities of the Zone, the canal and the locks, the labor, the hotels and commissary, sanitation, amusements and churches. In it all the writer has answered the everyday questions concerning Panama. Where other books on Panama devote much space to the history and politics of the region, Mr. Grier has consigned such encyclopedia information to a very few pages and has gone on in an entertaining way to recount the things he saw and the answers to the questions he asked. His observations are brightened by an occasional droll remark, and on the whole much valuable information is presented to the inquirer who wants to know about Panama. A busy man himself, the author explains, "It is not intended as a literary or artistic production, as a man engaged in other occupations has but little time to re-edit his material."

The illustrations which occupy many of the pages aid greatly in the reader's clear idea of the subject. Literally, the present volume may be said to be profusely illustrated. The subjects are well selected and give a vivid idea of life on the Isthmus.

As Mr. Grier has been engaged in electrical pursuits for many years, it was to be expected he would devote some paragraphs to electrical apparatus in the Canal Zone. Under the heading, "Telephones,'" he writes:

"On the timetable of the Panama Railroad there are 27 stations, 14 of which are marked as having telegraph stations. When in Colon I wished to communicate with Culebra, but did not find it marked as a telegraph station, and when I inquired of one of the Panama Railroad employes was told to go to Pier 11 and telephone. I found that all the various headquarters and departments along the line were connected by telephone, and it afterward proved a great convenience. This telephone system is part of the Panama Railroad equipment and gave good service. It is used extensively by the Canal Commission, and it can be safely stated that the telephone is doing its share in reducing the time for the completion of the canal. The telephone is an efficient time saver."

Mr. Grier has warm words of praise for the way the work of canal building is going on and the improvements that have been wrought since the American occupation of the Zone. "The force at work is efficient and energetic and has behind it the spirit and the brains of men who are able and intelligent."

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, July 21.—After carrying out his experiments at the Eiffel Tower with his wireless-telephone system, Lee De Forest has been making another series of trials at Marseilles. These were carried out between the radio-telegraphic station at the electrical exposition and a station on the steamer Ile de France. The latter is now cruising in the Mediterranean. According to the daily press, it appears that Dr. De Forest has been quite successful in sending telephone messages between these two posts, and the conversation can be heard very well. A somewhat novel effect has been produced in the course of these experiments. There is a wireless-telegraph post located at Saintes Maries, some 30 miles from Marseilles, and, without any special apparatus, the operator at that point could hear singing which came from the wireless-telephone apparatus.

A somewhat sensational invention is reported to have been made by a French engineer, Alfred Pouteaux of Dijon, in the shape of an electric mitrailleuse which will fire 1,200 shots a minute without using powder or any kind of explosive. A series of trials will soon be made, to which the members of the press are to be invited. Until these take place it will be somewhat premature to say what are the actual merits of the invention. Mr. Pouteaux says that his apparatus is based on the use of polyphase currents which have a relatively high frequency.

The Spanish telegraph department will award the contract during the present year for laying a submarine-cable system in the Canary Islands. It will extend from the Grand Canary, Palma and Gomera, on the one hand, to the farther islands of Fuertaventura and Lauzareto. The execution of the whole project calls for an outlay of $1,000,000.

A producer gas engine of the Letombe type has been put through a series of official tests in Belgium. This engine is rated at 1,000 horsepower and is run by a producer which burns ordinary coke. With this fuel the consumption was 0.608 kilogram of coke per horsepower-hour. The engine could stand a 30 per cent. overload very easily under the present conditions.

The annual concourse of the North France Industrial Society will have a greater interest than ever this year. New inventions and processes are to be tested, and there will no doubt be some interesting apparatus to be seen. The different sections of the concourse relate to the leading industries, and among the ones which are connected with electrical matters I note those which are classed in the civil engineering or mechanical arts section, including steam engines and boilers, gas engines, electrical apparatus, lighting, etc. In the chemical arts section are included electrochemistry and metallurgy and the resulting products. The prizes for the competition will be awarded after the official reports have been made, and the date is fixed for next January. Details of the concourse can be had from the secretary of the Société du Nord de la France, 116 Rue de l'Hôpital, at Lillé.

A project is on foot for a system of electric traction upon the canal running from the Marne to the Rhine, and it will be carried out by the East Industrial Company, as was decided at one of the recent meetings. As to the exact method to be used, no decision has been reached. A proposition has been made by the General Electric Company of Nancy (France) for an electric canalboat-haulage system for which this company owns the patents. According to this system there will be a series of motor-driven drums or capstans placed at intervals along the canal. The motors will be supplied by a three-phase feeder which will run overhead when in the rural districts and will be laid in underground cable in the towns and villages.

One of the large mining companies of Westphalia is using a new type of electric mine locomotive, which is constructed by the Felton-Guilleaume-Lahmeyer Company. It runs by a storage battery, which is carried in a removable case, and will draw a train of 30 coal cars. The battery can be unloaded and a new one put in place by one man and in a few minutes. A. DE C.

GREAT BRITAIN

London, July 25.—A serious position of affairs has arisen in connection with the experimental line which the London County Council has been operating in the East End upon the G. B. surface contact system. Owing to the number of accidents which have occurred on the line, mainly owing to live studs, the highways committee has decided upon the advice of the technical officers of the Council, to recommend that the experiment be abandoned. But that is not all. The matter appears to be resolving itself into a dispute between the owners of the patents and the Council on the question of compensation, for the former assert that all manner of alterations have been made to the equipment by the Council's officers without their consent. The cost of the equipment of the line and cars has been about $250,000. The situation in relation to this line is really ludicrous. On the one hand the roof of the tunnel of the District railway is too near the roadway to permit of the conduit system being laid down, while the Borough Council, which is the road authority, refuses, in its wisdom, to sanction the use of the overhead system. And the public grumbles at the horse cars.

The annual report of the electrical inspector of factories and workshops this year deals with the defects in many of the portable hand lamps which are now in use, and the general trend of the report once more illustrates the need for such supervision as he is able to give to these matters. As a result of his experience of such accidents and their causes, there has been brought out a type of portable lamp in which the body of the lamp is of wood. The lamp-holder, which is of the cord-grip type, is fixed in a vulcanite ring or cylinder which is extended so as to form a guard or sheath completely surrounding it. The wire cage is attached to a metal ring which is screwed to the outside of the wood base. There is no possibility of any metallic contact between the cage and the lamp-holder. The lamp-holder is supported in such a way as to give a large insulating surface between it and the metal cage ring in view of preventing leakage by a film of moisture if the lamp is used in a damp situation. The only weak spot appears to be the metal hook which, however, can without any difficulty be replaced by a leather or other non-conducting loop.

A Board of Trade inquiry has been held into the cause of the fire upon the City and South London Railway last week, and although nothing very definite was arrived at, yet sufficient was learned to show that most grossly exaggerated accounts of what took place appeared in the daily papers. As a matter of fact, only four ties were charred, and yet statements were published saying that for hundreds of yards the track had been destroyed. So far as the permanent way was concerned, the trains could have been running again half an hour after the outbreak was overcome. Some damage was caused to the cables, however, and this took time to repair. The opinion of the electrical engineer to the company is that the fire was probably due to some waste upon the track being set on fire by a spark from a shoe of the locomotive. The report of the Board of Trade officers may throw some additional light on the matter. G.

NEW YORK

New York City, August 1.—The extension of the Subway from Two-hundred-and-twenty-first Street to Van Cortlandt Park was opened to the public at one o'clock this morning, when the first regular train went over the route. There are stations at Two-hundred-and-thirty-second and Two-hundred-and-thirty-eighth streets, as well as at the terminal, Two-hundred-and-forty-second Street, but at present the Two-hundred-and-thirty-eighth Street station is not completed, and may not be used for some time. A special train of two cars, in which were General Manager Frank Hedley and most of the engineering corps of the Subway, Commissioner Eustis of the Public Service Commission, and half a dozen other invited guests, went over the new extension yesterday morning.

Henry B. Seaman, engineer for the Public Service Commission, has explained how the next subway in Manhattan would probably be constructed. He declares that the new subway would cost less relatively than the old, and that instead of using steel pillars between the rails, as in the present subway, the plans called for solid walls between the north and south bound tracks, and that where pillars were necessary they would be built of reinforced concrete. The walls, he said, would materially diminish the possibility of derailment, and the concrete construction would reduce the cost by doing away with the employment of ironworkers. Much of the construction work, Mr. Seaman said, would be done without disturbing the surface of the street.

Panic followed the blowing out of a fuse on a Graham Avenue (Brooklyn) trolley car on the Brooklyn Bridge, and 30 passengers plunged head first from the swiftly moving car. In jumping one woman fell on her head and was killed, eight men and women passengers were injured, and a baby, which had been held in its mother's arms, was thrown to the tracks and hurt. Most of the passengers were Italians.

The Metropolitan Street Railway has determined to change the color of its cars. The buff bodies will give way to dark green. Oren Root, general manager of the Metropolitan, explains that the alteration was made because the old color got shabby so quickly.

The Public Service Commission, in its plans for the fender tests, is counting on the use of manikins made especially for the purpose to represent a child, a youth and a full-grown man, but if all manufacturers succeed in hiring living dummies there will be no necessity for the use of lay figures. The manufacturers are offering men $2 a day to be struck by cars fitted with their fenders. When the tests were decided on the commission sent out letters, inviting the participation of manufacturers, to all the known firms in this country and Europe. The response has been surprising. Already 40 manufacturers in America have signified their intention of entering the competition, and one large firm in Europe has written for specifications. About 100 other manufacturers here and abroad have asked for particulars, and the inference from their letters is that most of them will enter the competition. At the present time there are 10 or 12 distinct types of fenders in general use, and about as many more forms of wheel guards, but many other types are being manufactured and others are being invented all the time. The tests are to be held at Schenectady in September and another series in Pittsburg in October.

SOUTHEASTERN STATES

Charlotte, N. C., August 1.—A company has been formed to develop a mountain waterpower near Brevard, N. C., on Little River in Transylvania County. The concern will be known as the Cascade Company, with a capital stock of $30,000 to begin with. W. P. Whitmire of Brevard is interested in the enterprise.

The Chadwick-Hoskins Company, Charlotte, N. C., will equip its large cotton mills in Charlotte with the electric drive. The Louise mill of the aforesaid mill has already been equipped with 750-horsepower motors by the Westinghouse Company, and the Chadwick and the Hoskins mills will be similarly equipped.

A resolution was introduced in the aldermanic board at Macon, Ga., recently, calling upon Mayor Miller to name a committee of aldermen and citizens to investigate the advisability of city ownership of the electric lighting system, and the committee has reported favorably upon a resolution looking to the city's owning its own plant.

One of the largest electrical companies organized in Virginia in some time is the Roanoke (Va.) Traction Company, with $500,000 capital stock. The company proposes to have headquarters at Roanoke, Clifton Forge and Lynchburg, and will furnish electricity for lighting, heating, etc., in these towns. A waterpower known as the "Horseshoe," near Lynchburg, will be developed by the company, of which James P. Wood of Roanoke is president and James C. Martin, secretary-treasurer.

It is reported from Marion, N. C., that a $100,000 electric company has been organized there to develop a 1,000-horsepower hydro-electric plant on the Catawba River, near the town.

The Roanoke Railway and Electric Company, Roanoke, Va., has employed J. J. Kennedy as engineer to prepare plans for the development of a waterpower at Little Tunnel on the James River, on which a favorable report was previously made by Mr. Kennedy.

Plans are being consummated for beginning work on an electric railway from Atlanta to Macon, a distance of several hundred miles, and power will be secured from the Central of Georgia Power Company, now building a big dam on the Ocmulgee River, near Jackson, Ga.

The town of Durham, N. C., has been for two months agitating the lighting contract problem. The Durham Traction Company, in response to the city's proposition of $80 per light on a two-year contract, offers lights at $85 on a five-year contract. There was talk of shutting down the light plant on account of the lack of harmony and matters are still unsettled. It is said that interests headed by B. N. Duke of the American Tobacco Company will have power to deliver in Durham within 20 months at a lower rate than that charged by the Durham Traction Company, the new power coming from a distant waterpower development. The city for this reason is said to desire only a two-year contract. L.

OHIO

Toledo, August 1.—The council of the city of Youngstown, Ohio, has entered into a new lighting contract with the Consolidated Company whereby the latter agrees to furnish an all-night service every night in the week at the old price which was charged for the Philadelphia moonlight schedule—$68 a lamp.

Active operations toward the completion of an electric railway between Marion and Findlay, Ohio, have been begun. Rights-of-way have been secured and the line looks like a certainty. It will pass through Hepburn, Marseilles and Forest.

The electric-light plant at Morenci, Mich., will be sold at public auction to satisfy the demands of mechanic lien holders, the court ordering that it shall not be sold for less than $3,500. The order was made in the case of Frank Sanborn and others against the Ohio Valley Electric Supply Company.

The grading is about all completed on the new electric railway between Marion and Bucyrus, Ohio, and present plans contemplate the carrying of passengers to Marion by August 10th. The cars are running over a portion of the line now.

Plans have been prepared for the erection of a new electric power plant at Hamilton, Ohio, to be constructed and operated by the Hamilton Hydraulic Company and managed by T. A. Jones, superintendent of the Harding paper mill of Excello. It will be owned by the Harding estate, of which Congressman J. Eugene Harding is a member. The site will be that of the old Franklin paper mill at Front and Buckeye streets. S.

INDIANA

Indianapolis, August 1.—The interurban railways of Indiana carried their share of the traveling public last year. They carried 28,482,487 passengers, and the fares amounted to $9,240,909.82, an average of about 33 cents a passenger.

The Indianapolis and Southern electric railway may be turned over to a syndicate fully able to equip and operate it as a first-class trolley line between Indianapolis and Louisville.

The Lakeview Traction Company, headed by Thomas Taggart of Indianapolis, has been awarded a contract for the construction of a traction line connecting Memphis, Tenn., with Lakeview, Miss., a distance of 12 miles. The cost of this line, including electrical equipment, rolling stock, etc., is estimated at $200,000. Mr. Taggart will erect a $100,000 casino at Lakeview. The contract went to M. J. Roach.

The Chicago, Lake Shore and South Bend Railway Company opened its electric line for service between Hammond and Gary on August 1st. The company is rushing the work on its line between Michigan City and Hammond, with a view of beginning through service between South Bend and Chicago on September 1st.

The South Bend Construction Company has been incorporated for the purpose of making a specialty of constructing electric railroads and power houses. The company's home office will be in Michigan City and in charge of H. W. Wallace.

The city authorities of Evansville are preparing to ask for bids for the installation of a new fire-alarm system with a maximum capacity of 400 boxes.

The Penn American Plate Glass Company of Alexandria will equip its big plant for electrical operation.

Under the new electric-lighting contract the city of Lafayette will, beginning September 1st, pay $37.98 per street lamp for 2,500 hours, and the citizens will secure commercial lights at a surprisingly low rate. The city officials assert that Lafayette and its citizens will enjoy electric service under the most favorable contract of any city in the United States.

The Union Trust Company of Indianapolis, trustee, is asking for bids for the completion of the Indianapolis, New Castle and Toledo electric-railway line between Indianapolis and New Castle. Bids will be received until August 20th.

A franchise has been granted the Northwestern Indiana Telephone Company to build and operate an exchange and system in Miller, Ind.

The directors of the South Bend Home, the Napanee and the Warsaw telephone companies—all Independent—have entered into an arrangement for the construction of an all-copper circuit between the three cities.

The talk about consolidating the competing telephone systems at Indianapolis, which caused considerable uneasiness among the Independent companies throughout the state, has all died out. It is now generally conceded that telephone conditions in Indianapolis make such a consolidation not only impractical but illegal. The modified franchise granted to the Indianapolis Telephone Company will be ratified at the next Council meeting, both Judge Allen and Judge Clark having refused to issue an injunction against the company's accepting of such franchise from the city.

The Home Telephone Company (Independent) of South Bend has been awarded a contract for the installation of a modern switchboard with a capacity of 100 or more telephones in a new hotel in the course of erection at Mishawaka. S. S.

ILLINOIS

Peoria, August 1.—The Illinois Traction Company owns the lighting plant at Bloomington, and it has decided to relay the main artery of the hot-water heating system along Madison Street, a distance of some 800 feet. The pipe that will be taken out is a part of the old De Mange system of hot-water heating.

An extension of a $6,000,000 mortgage on the property of the Central Union Telephone Company has been filed in the recorder's office in this city. The original instrument was made in favor of the Old Colony Trust Company of Massachusetts in 1899, at which time the lines of the company in Illinois were rebuilt. A full copper line to Canton from this city has since been built and is included in the instrument. The mortgage bears the signature of L. G. Richardson, president, and W. S. Chapman as secretary.

The new terminal station of the Illinois Traction Company at Springfield will be ready for occupancy inside of 10 days. Work on the building is being rapidly pushed. There will be three tracks under the car shed for the passenger cars. Besides the ticket office there will be toilet rooms, check rooms and a restaurant and fruit stand. A special operator will have charge of the telephones. There will be the two city telephones and the company's own system used for the dispatching of the cars. V. N.

NORTHWESTERN STATES

Minneapolis, August 1.—A special election will be held at Valley City, N. D., to vote on bonds for $18,000 for the municipal electric-lighting plant.

The Sheffield Brick and Tile Company of Mason City, Iowa, has purchased the equipment for the electric-lighting plant for its establishment and for the city from the Northwestern Electrical Equipment Company of Minneapolis.

Frank Weatherhead has the contract for building the brick power house for the electric-light plant at Sidney, Iowa.

F. W. Schreiber is organizing a stock company to install an electric-light plant of about 2,000 lights capacity at Sloan, Iowa.

An election will be held August 17th at Spirit Lake, Iowa, to resubmit the proposition to bond the town for $2,000 for the maintenance of the light plant.

Messrs. Hale and Bailey are trying to make arrangements to procure electric lights for Hinckley, Minn., from Sandstone, Minn.

The Cincinnati Construction Company of Janesville, Wis., has been incorporated by J. M. Bostwick and others of Janesville for $25,000 to build an electric interurban railroad from Janesville to Madison at an estimated cost of $900,000.

The lighting system at the Cheyenne River Indian reservations at Cheyenne Agency, S. D., will be brought up to date by the installation of an electric-light plant.

The contract for the electric-light and water plant at Alexandria, Minn., from plans by Edward P. Burch, consulting engineer of Minneapolis, was awarded to J. G. Robertson of St. Paul for $22,590, exclusive of the foundation. The plant complete will cost about $27,000.

The City Council of Hartford, Wis., has purchased the L. Kissel & Sons' electric-light plant for $5,000 and will expend some $27,000 in installing a municipal alternating-current plant.

As a result of negotiations between the Winnebago Traction Company of Oshkosh and the Eastern Wisconsin Electric Railway and Light Company of Fond du Lac, Wis., the line of the former company will be extended from Omro to Berlin and an electric line built from Fond du Lac to Watertown and Milwaukee.

The Shelby County Interurban Association of Harlan, Iowa, has been organized for the purpose of promoting the building of an interurban road from Harlan to Des Moines. C. D. Booth is secretary of the association. Two surveys will be made from Harlan to the Audubon County line, one via Kimballton and the other by way of Fiscus.

Mayor Lawler of St. Paul has sent a communication to the City Council recommending an investigation of the reasonableness of telephone rates.

The American Telephone and Telegraph Company has tendered a check for $1,771.80 as taxes upon the company's interstate business under protest as a result of a recent trial court decision. The state will not accept the tender until it is determined whether the company may not be held for back taxes for six years. R.

WESTERN CANADA

Winnipeg, August 1.—The City Council of Edmonton, Alberta, is considering a proposition made by Mayor Macdougall whereby the city can have a municipal street-railway system before the end of the present year. It is estimated that if five miles of line are constructed in Edmonton and three miles across the river in Strathcona the line will pay from the start with a half-hour service. Mayor Macdougall believes the city will have enough power from the new city power plant to operate the system, which will cost approximately $125,000.

W. H. Cook, president of the Duluth, Rainy Lake and Winnipeg Railroad, said in an interview that work has again started on the large power dam at Fort Francis, Ont., by the Brooks-Backus syndicate, and that the work will be completed within a year. The work will cost about $700,000.

The Montreal Engineering Company, Montreal, Que., has made a proposition to build an electric street-railway system in Calgary, Alberta.

Superintendent Madison of Vancouver, B. C., has reported that the water mains in portions of the city are beginning to show the effect of electrolysis through the leaking of the current from the rails of the street railway. A similar condition of affairs prevailed two years ago, but the British Columbia Electric Railroad Company connected its rails to the mains at many points, which abated the trouble. In the last two months, however, it has appeared again.

The civic power plant at Nelson, B. C., has been formally taken over by the city from the contractors, the Allis-Bullock Chalmers Company, Montreal.

A meeting of the taxpayers of Alberni, B. C., was held last week to protest against the application of the Vancouver Island Power Company for water from several rivers in the vicinity of Alberni. The wish of the taxpayers appears to be that the water rights be preserved for municipal development. R.

PACIFIC SLOPE

San Francisco, July 29.—The Yosemite Dredging and Mining Company, which has been figuring upon purchasing power from the La Grange system or other electric transmission lines, finally decided to install its own power plant to supply its gold dredge near Merced, Cal. The contract for the generator and auxiliary electrical equipment has been awarded to the Westinghouse Electric and Manufacturing Company, through the San Francisco office.

The report is current that the United Railroads of San Francisco is negotiating for the purchase of the entire uncompleted power plant of the Stanislaus Power Company at Vallecita, Calaveras County. The deal involves a sum exceeding $3,500,000, and if completed will put the local street railways company in control of a 36,000-horsepower plant. This is considerably in excess of the amount of power needed to operate the street-railway system. The remaining power will be sold to consumers.

Advices from Medford, Ore., say that F. H. Ray of New York, vice-president of the American Tobacco Company, and president of the Rogue River Electric Company, formerly the Condor Water and Power Company, recently left there for New York after a visit of 30 days in Oregon. While there he gave final orders for the enlarging of the power plant, which is now furnishing electric power to Southern Oregon towns. When the entire improvement, for which plans are laid, is completed, Southern Oregon will have one of the important power plants of the West.

Electric pumps have been ordered to increase the water supply of Colfax, Wash., where there is now a shortage. A well 50 feet in diameter is being sunk. Two water tanks will be built and the pumps will fill these with water from the South Palouse River.

The Granite City Light and Power Company has been incorporated at Ashland, Ore., and capitalized at $100,000 by E. K. Anderson, C. H. Hosley, G. W.

Barron, George W. Owen and I. N. Shook of Ashland. The objects of the corporation are to develop and furnish light and power to consumers in Jackson County. The estimated cost of installing the plant and wiring the town is between $50,000 and $75,000.

H. P. Scheel and William McArthur have secured a water right and a right-of-way from the falls in the Deschutes River, about 15 miles from Tenino, Wash., and propose to develop the power there by installing a large electric plant. They expect to develop approximately 12,000 horsepower with the plant and will use electric power in their stone quarry besides furnishing lights to the towns within reach and power to all who wish it.

The voters of Cashmere, Wash., have decided in favor of a $10,000 bond issue to provide for a municipal waterworks system and electric-light plant.

The Butte Engineering and Construction Company of San Francisco has taken a $3,700 electric wiring contract for the six-story building which is to be erected near the corner of Sutter and Kearny streets, San Francisco.

Radical changes have been made in the heads of departments of the Pacific Telephone and Telegraph Company. W. J. Phillips will be transferred from San Francisco to Portland, Ore. J. H. Corcoran, division superintendent in the Northwest, has been transferred to San Francisco as superintendent of traffic of Central and Northern California. The Coast has been redistricted with three main divisions. A.

PERSONAL

Mr. Louis A. Ferguson of Chicago assumed office as president of the American Institute of Electrical Engineers on August 1st.

Mr. H. A. Everett, of Cleveland, is reported to have resigned as president of the Toledo Railways and Light Company and also as director of that company.

Congressman W. B. McKinley of Champaign, Ill., who is the head of the Illinois Traction System, will succeed James S. Sherman, Republican vice-presidential candidate, as chairman of the congressional campaign committee.

Mr. Theo. Feilden, it is reported, has resigned his position as editor of the Electrical Magazine of London in order to take up the position of business manager of the London Times Engineering Supplement. Mr. Feilden is well known in the United States.

Mr. William L. Taylor of Indianapolis, formerly attorney-general for Indiana, has turned his attention to the railroad business. Mr. Taylor has gone to Amsterdam, Holland, to superintend the construction of an interurban electric road to be operated by a company of which he is president.

Mr. C. H. Raupp is the new general manager of the Youngstown (Ohio) and Southern Electric Railway. He has served two years with the company as general superintendent under former Manager S. J. Dill, who will take up a position in Elmira, N. Y. In Mr. Raupp's 13 years in the electric traction field he has been with the Mt. Clemens Rapid Transit Railway and the Detroit, Monroe and Toledo Short Line.

Dr. Howard M. Woodhead and Dr. Milo M. Quaife of the University of Chicago have been engaged to collect and tabulate information for use in the construction of the proposed Chicago subway. Their work will be to gather information in cities where similar engineering problems have been completed or are under way. Dr. Woodhead is at present working in London, and will go on to Paris, and Dr. Quaife is to work in New York, Philadelphia and Boston.

ELECTRIC LIGHTING

Sidney, Iowa, will install an electric-lighting plant.

Colton, Cal., will shortly increase the capacity of the electric-light plant.

Valley City, N. D., will vote on the issuance of $30,000 in bonds for an electric-lighting plant.

The city of Sallisaw, Okla., has purchased the electric-light plant of Day & London for $10,000.

The Union Electric Light and Power Company and the Bell Telephone Company of St. Louis have agreed to put all wires along the city boulevards underground.

George Collison, Estevan, Sask., Canada, will build an electric-light and power plant at Killarney, Man., having received a bonus and certain concessions from that town.

W. M. Ratcliffe has purchased the dam at Cureo, Texas, and will rebuild the burned power house, installing temporary machinery to furnish the city with light and power.

R. S. Howland, John H. Carter and G. W. Eppes have incorporated the Weaverville (N. C.) Electric Company with a capital stock of $100,000. Their purpose is to develop waterpower property and transmit electricity for power and lighting. The establishment of cotton plants is also intended.

The electric-light plant on the beach at Colon, Canal Zone has been moved and will be consolidated with the one at Cristobal. In the enlarged plant oil will be used in place of coal for fuel.

The power plant at Bonnington, B. C., supplying 1,500 horsepower to the city for lights and power for the tramway and industries, will be taken over by the city and extensions made by next year.

T. M. Hodgins of Butte, Mont., who owns the St. Anthony electric-light and power plant, has purchased the property of the Rexburg Light and Power Company for $25,000 and will consolidate the two plants, inaugurating a day-and-night service.

A consular officer reports that the new $350,000 electric-light works at Hankow, China, is owned entirely by Chinese. The generating plant is capable of supplying 25,000 16-candlepower lamps and is expected to be ready to furnish current in August.

The Lake Charles (La.) Railway and Light Company, a new corporation, will take over the franchises and property of the Lake Charles Street Railway Company and will build, purchase and operate electric railways in Louisiana and furnish light, heat and power. The capital stock of the company is fixed at $75,000. Thompson J. Bird is president.

The Denver (Colo.) Gas and Electric Company reports gross earnings of $2,062,326 and net earnings $825,156 for the year ending June 30, 1908. Of the total increase of $138,791 in net earnings, $108,807, about 80 per cent. was accomplished during the period commencing with October, 1907, so that the business depression beginning that month seems to have had little effect on the company's business.

ELECTRIC RAILWAYS

The Gainesville, Whitesboro and Sherman Interurban Railway will erect a power house at Gainesville, Tex.

August 1st was the date set for beginning construction on the new interurban railroad from Louisville to Nicholasville, Ky.

The electric line which is to connect Rochester, N. Y., with Lockport and Buffalo is promised to be in operation within a month.

The Industrial Power Company is a new corporation supplying steam power to some manufacturing plants in the vicinity of Little Rock, Ark.

Shimer & Chase have been granted a franchise to construct an electric-railway line from South Omaha, Neb., to the new industrial town of Ralston.

Increased demands for power in the Imperial Valley has made necessary additions to the plant of the Holton Power Company, amounting to $125,000 in value.

Steel has been ordered for the extension of the Alton, Jacksonville and Peoria electric road from Godfrey to Jerseyville, Ill. The line is already in operation between Godfrey and Alton.

The preliminary work of securing concessions for the right-of-way of an electric line between Citronelle and Mobile, Ala., is about completed. Construction work will start this fall.

Louis Boley of Pensacola, Fla., has applied for a franchise to construct an electric-railway line from Pensacola to Olive, a small town 10 miles from the city. The proposed road will pass through a region enjoying no railroad or good carriage road facilities.

The electric railway commission of the District of Columbia has received a refusal from the Capital Traction Company of Washington to supply the commission with car and schedule data. Although its power has been ignored by the company the commission will continue to investigate complaints and bring suits for violations of regulations until its own status is fully determined in the fall by the Interstate Commerce Commission.

Following its policy intended to discourage the building of feeder lines by private persons or companies, the Northern Pacific Railroad has notified the builders of the new electric line from Nez Perce, Idaho, to Vollmer, that no connections will be made with the new road. It had been hoped to secure arrangements to permit the electric road to load directly into the Northen Pacific cars, but all freight will now have to be transferred.

A tunnel more than a mile in length, said to be the longest in existence for use by municipal electric surface car lines, has just been opened for operation by the Genoa Street Railway Company. It connects Genoa, Italy, with the adjacent large commune of Rivarolo, which previously was reached by circling the mountain, the distance being now shortened 1⅓ miles, and the trip is made in 15 minutes less time. Constructive works began on June 1, 1905. The boring was accomplished by 900 workmen, operating partly by hand, by electrical machines, and by compressed-air machines.

The Oregon Electric Company has filed a mortgage for $10,000,000 on its line between Salem and Portland and all proposed extensions in Oregon covering the Hillsboro-Forest Grove extension.

Over 500 men are now employed by the Utah Light and Railway Company on street-railway and construction work in Salt Lake City. Since the 1st of January over 12 miles of track has been relaid with heavier rail and ballasted, and it is hoped this will be more than doubled by the end of the year. During 1907 the company reconstructed about 29 miles of track. The total mileage of city lines is approximately 100 miles. All the track in the city will be replaced with the 60-pound rail, graded and thoroughly ballasted.

A traction company incorporated at Vincennes, Ind., promises to give New Albany a direct electric line to St. Louis. The proposed line from Vincennes to East St. Louis will be built by the Vincennes, Centralia and East St. Louis Traction Company, the incorporators being J. J. Burns, Dennis O'Connor and J. E. Burns of Chicago. At Vincennes the line is planned to connect with the Vincennes, French Lick and West Baden Railway and with the Louisville and Northern Railway and Lighting Company, running to New Albany.

POWER TRANSMISSION

Baxter Morrison is president of the Inverness Power Company, just incorporated for $25,000 at Inverness, Fla.

The Tuscarora Indians have agreed to permit the Niagara, Lockport and Ontario Power Company to build a power transmission line across their lands on payment to them of $2,000.

C. A. Cleaver, president and mechanical engineer of the Texas Power Company, Houston, Texas, is proposing to install ten 1,000-horsepower units in the new plant of his company. The power will be derived from producer plants and gas engines.

The Raleigh (N. C.) Cotton Mills, operating 15,000 mule spindles; the Pilot Cotton Mills Company, operating 800 spindles and 325 looms, and the Caraleigh Mills Company, operating 10,816 spindles and 436 looms, have contracted with the Central Carolina Power Company for electric power.

The Columbia Gas and Electric Company of Cincinnati will consider a project to generate electrical power in the gas fields of West Virginia by large gas engines, the power to be transmitted into Cincinnati over high-tension lines. A similar development in the Kansas gas fields may be made to supply St. Louis with power.

The O'Keefe-Orbison Engineering and Construction Company is making plans for a hydro-electric development near Iron Mountain on the Menominee River for the Oliver Mining Company, a subsidiary of the U. S. Steel Corporation. The project includes a new dam that will develop power under a 61-foot head of water and produce about 12,000 electrical horsepower.

The Menominee and Marinette Light and Traction Company will increase its capital stock from $560,000 to $1,000,000 and purchase the waterpower rights at Grand Rapids on the Menominee River, which include 1,600 acres of land on either side, extending two and one-half miles along the banks. The low-water estimate for the horsepower to be developed, including the reserve, is 6,500 horsepower.

The Peerless Electric Company, which is making hydro-electric improvements in Newton Falls, on both branches of the Mahoning River, has the work well under way, and will be supplying electrical power to Youngstown, Ohio, by October 1st. The company has recently closed options on the Grand River at Parkman. The power not used by the Peerless company will be sold in Warren. The developments in Newton Falls and Parkman will mean an outlay of fully a million dollars.

The Kobe Syndicate, Limited, in which American and English financiers are interested, has acquired concessions in the Japanese Alps capable of ultimately developing 300,000 horsepower, to be furnished to enterprises in Tokio, Yokohama, Kyote, Osaka, Kobe and other commercial centers of Japan. Julius M. Howells, an American, is the syndicate's engineer, and plans to connect two rivers by a tunnel through the Japanese Alps. The estimated cost of carrying out the syndicate's plans is $8,500,000, the capital to be raised in Japan and England.

TELEPHONE

The Enterprise Telephone Company has been organized by A. Washburn, J. J. Hill and others at Quinlan, Okla.

The Rocky Mountain Bell Telephone Company will install new office equipment in its exchange at Miles City, Mont., which is just completed, and will also make extensive improvements in the outside plant.

The Grant and Dallas County Telephone Company has been incorporated with a capital of $25,000 at Carthage, Ark.

The Farmers' and Merchants' Telephone Company has been incorporated at Linn Grove, Iowa, with a capital stock of $15,000.

The work of setting poles for the telephone line which is to connect Miles City and Forsyth, Mont., is complete and ready for the wire.

A new central exchange, costing $25,000, will be erected at Portage la Prairie, Man., and a central-energy system is promised for next year.

The Iowa Telephone Company is working on its new underground system at Clinton, Iowa, and has also received 18,000 feet of cable, which it will put in at Fort Madison, Iowa.

The Kenton (Ohio) Telephone Company has registered an increase of capital stock from $100,000 to $150,000. James L. Moore is president and Charles H. Shanafelt, secretary of the company.

The articles of incorporation of the Boone County Telephone Company have been amended so as to show that the name of the corporation is the Boone County Telephone Company and its principal place of business Boone, Iowa. The capital is $303,000—$300,000 preferred and $3,000 common.

R. A. Frazier of Nevada, Iowa, has secured a temporary injunction restraining U. S. Alderman and J. A. Mills from disposing of options on the stock of the Nevada Mutual Telephone Company. At a special meeting of the company M. C. Allen was elected president in place of U. S. Alderman.

PUBLICATIONS

Recent "blotters that will blot," issued by the New York Insulated Wire Company, give a calendar for August and brings the interesting series on rubber production down to inspection at Para.

Some useful formulas for various alloys using antimony are contained in a little folder sent out by C. W. Leavitt & Co., 220 Broadway, New York city, who advocate the use of "A. S. P." brand English Star antimony in the preparation of babbitt and anti-friction metals.

The Central Electric Company, Chicago, is distributing a new edition of its bulletin, entitled "Inexpensive Lighting Fixtures." This bulletin should be interesting to central stations, especially the section referring to tungsten fixtures. The unique feature of this bulletin is the complete harmony of detail in the plain and artistic designs reproduced therein.

The Pacific Electric Heating Company, Ontario, Cal., is making a specialty of the Pacific electric iron—"the iron with the hot point," as it is known. To acquaint central-station managers with its goods the company has begun issuing a monthly magazine, "Hot Points." A unique feature of the July number is a central page which has been given a scorched impression from the iron by allowing it to rest on the paper 10 seconds. The result is an original record that would convince the most dubious of the truth of the claim for the "hot point." As the "nose" of the iron comes in contact first with the cold, damp goods, it is important that the point should have extra heat. Copies of "Hot Points" will be sent on request.

The General Electric Company, Schenectady, N. Y., has two recent bulletins describing its improved automatic voltage regulators. These devices are for the automatic regulation of the voltage of alternating-current and direct-current generators. They are made in various styles for the control of the voltage of one generator or of two or more generators in parallel. Among the advantages secured by such voltage regulation are the reduction of lamp renewals, saving in energy and the decrease in the number of switchboard attendants necessary. Bulletins No. 4601 and 4602 fully describe the regulators for alternating and direct-current generators, respectively, and contain diagrams showing the various connections and arrangements of the different styles of regulators.

Two of the recent bulletins of the Fort Wayne Electric Works—No. 1107 and 1108—describe "Standard Alternating-current Single-phase Switchboard Panels" and "Multiphase Revolving-field Belted Generators." Both are attractively illustrated. No. 1107 contains several instructive switchboard-panel diagrams. The line here described includes panels equipped for a single generator; for one generator and two circuits; one generator and one transfer circuit; one generator, an incandescent and an arc-lighting circuit, and also feeder panels of different kinds. In Bulletin 1108 it is pointed out that one feature peculiar to the equipment provided with the generators mentioned is the combination alternator-exciter field rheostat designated as type AE, which is furnished with all Fort Wayne generators, unless otherwise specified. A diagram is given showing the field-circuit connections using this type of rheostat.

The many forms of Jeffrey conveyor and hoisting machinery for the handling of coal and ores are handsomely illustrated in Bulletin No. 25, issued by the Jeffrey Manufacturing Company, Columbus, Ohio. The display includes apparatus useful to the power plant. An interesting installation for handling coal and ashes is that of the Peoria (Ill.) Gas and Electric Company, where a Jeffrey hoisting tower, with cantilever and grab-bucket, is shown taking coal from a railway car. With a one-ton bucket and similar machinery coal may be taken from barges at the rate of 50 tons an hour and deposited into a 150-ton storage bin. The Jeffrey company manufactures electric mine locomotives, coal-cutters, rotary drills with flame-proof motors, and cranes, besides its large line of conveying and hoisting apparatus.

SOCIETIES AND SCHOOLS

The occasion of the opening of a new Lynn factory of the General Electric Company on July 24th was celebrated by a big entertainment and ball held by the Thomson-Houston Mutual Benefit Association. About 4,000 persons were present and two floors of the building were given over to the occasion.

The twenty-third list of the names of officers and members of the Western Society of Engineers, with constitution and by-laws, has been issued. It bears date of July, 1908. C. F. Loweth is president of the society and J. H. Warder is secretary. P. Junkersfeld is second vice-president and D. W. Roper is chairman of the Electrical Section. The total membership is 1,007, and there are 796 active members. The society is in a prosperous condition, and its quarters on the seventeenth floor of the Monadnock Building, Chicago, are being greatly enlarged.

MISCELLANEOUS

The Western Union Telegraph Company has been sued for $898,500 by the state of Iowa for the alleged violation of laws of that state in failing to pay the required fee on its capital stock, together with the penalty fixed for each day's violation of the law.

A strike was settled by means of radio-telegraphy while the steamer Theodore Roosevelt was in midlake on August 1st. A dispute was in progress between the owner of the boat, who was on board, and the Seamen's Union of Chicago. While the vessel was on its way to Michigan City from Chicago a settlement was reached by "wireless." This is believed to be the first instance of the kind on record.

TRADE NEWS

The Southern Illinois Electrical Company of 508 Missouri Avenue, St. Louis, Mo., is seeking to incorporate. The officers are H. G. Paro, president; H. M. Bean, vice-president; Ira L. Pendelton, secretary and treasurer.

The J. G. Barr Electric and Heating Company has taken out incorporation papers to do a general contracting and heating business in Chicago, with a capital of $10,000. Incorporators are Jesse G. Barr, Gottlieb Sexauer and Arthur B. Irwin.

The Rice Electric Company of Dayton, Ohio, has been incorporated with $500,000 capital stock by Elwood E. Rice, Walter Worman, A. M. Kittredge, Frank T. Huffman and Harvey C. Kittredge. The new company will manufacture and operate electric sign displays.

Sealed bids will be received by M. Peterson, secretary of the Civic Board of Control, Winnipeg, Man., until August 31st for the supply of 50,000 arc carbons for the street-lighting system, one-half to be cored and the other half solid. Specifications and form of tender may be obtained from F. E. Cambridge, city electrician, Winnipeg, Man.

Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until 3 p. m. on September 30th for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States postoffice and courthouse at Cape Girardeau, Mo. Drawings and specifications may be obtained from the custodian of site at Cape Girardeau, Mo., or at the office of the supervising architect.

Mr. Henry F. Frosch, for many years connected with the Commonwealth Edison Company and for the last year and a half the California representative of the Federal Electric Company of Chicago, has just returned to San Francisco, after a few weeks' visit in Chicago. During his sojourn in this city he has added to the lines he will represent on the Coast the following: Excello Arc Lamp Company, flaming arc lamps; General Incandescent Lamp Company, incandescent lamps; Minerallac Company, minerallac and specialties. The many Chicago friends of Mr. Frosch wish him every success in his enlarged field.

For the 12 months ended June 30, 1908, Germany imported from the United States electrical appliances (including telephonic apparatus) valued at $192,502 and electrical machinery valued at $100,930. Compared with corresponding figures for 1908, there was a respective decrease of $195,867 and $4,863.

It is reported that both the Western Electric and General Electric companies have entered the copper market for the first time since the decline in the price of the metal below 26 cents. The General Electric people seem to think that the low prices for copper have been reached and that improvement may now be expected. The Western Electric is an unusually large consumer of copper since it furnishes most of the telephone supplies of the American Telephone and Telegraph Company.

The Western Electric Company has recently established an apparatus department in its new branch house at Dallas, Tex., in charge of Mr. W. L. Green, who has been for several years connected with the sales organization in Chicago and St. Louis. The territory covered by the Dallas house comprises all of Texas and the northern portion of Old Mexico, and the establishment of this department may be taken as an indication of the tremendous growth and future possibilities of this section along all electrical lines.

On Friday, July 24th, the American District Steam Company of Lockport, N. Y., suffered the loss by fire of a portion of its Tonawanda plant, where its casing mill and foundry are located. Friends of the company, while regretting this casualty, will be pleased to learn that plans have been made for rebuilding the burned portion on an enlarged scale and with fireproof construction as nearly as may be. The company announces that its business for the season will not be delayed on account of the fire. The loss is fully covered by insurance.

BUSINESS

The Grant Electric Company has been incorporated at St. Louis, Mo., by Adolph Zeust, Jr., and others.

A small instrument known as a lamp-testing watt indicator has been placed on the market by the General Electric Company, Schenectady, N. Y., and was designed for the purpose of giving a practical demonstration of the relative watt consumption of metallic and carbon-filament lamps. This instrument is intended for use with Edison base lamps, but can be provided with an adapter permitting its use with either Thomson-Houston or Westinghouse socket or lamp base. The instrument is of the portable type and can be carried in the pocket. It is fully described in Bulletin No. 4609, which will be sent upon request.

The increasing use of small Curtis steam turbines is shown by an inspection of a partial list of turbines under 500 kilowatts capacity which, up to the present time, have been installed by the General Electric Company or are under construction. Of the 570 turbines listed, representing a total capacity of about 37,000 kilowatts, seven per cent. are for the export trade. The remainder are intended for domestic service in central stations, marine work, laboratories of educational institutions, power and lighting plants for hotels and office buildings, laundries, mines, printing establishments and in every branch of manufacturing. Among the diversified industries using the machines are woodworking plants, foundries, iron and steel mills, distilleries, chemical plants, ice plants, textile mills, breweries, tanneries, flour mills, shoe factories, paper mills, machine shops and ammunition manufacturing plants. Turbines for train lighting are finding a ready market. The latest application of moderate-size Curtis turbines is for driving fire pumps. On board ship, where a compact generating unit is required, small turbine lighting sets are also rapidly coming into favor.

DATES AHEAD.

Michigan Electric Association (annual meeting), Grand Rapids, Mich., August 18th to 21st.

International Association of Municipal Electricians (annual convention), Detroit, Mich., August 19th, 20th, 21st.

Ohio Electric Light Association (annual convention), Hotel Victory, Put-in-Bay Island, August 25th, 26th and 27th.

Old Time Telegraphers' Association and Society of the United States Military Telegraph Corps (annual reunion), Cataract-International Hotel, September 16th to 18th.

Colorado Electric Light, Power and Railway Association (annual convention), Glenwood Springs, Colo., September 16th, 17th and 18th.

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

Chicago Electrical Show (fourth annual), Coliseum, January 11 to 23, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) July 28, 1908

894,187. Wireman's Soldering Tool. Patrick A. Cassidy and Frank L. Payne, Englewood, Colo. Application filed July 29, 1907.

This tool for soldering spliced joints in electric wires consists of a pair of handles pivoted together between their ends, a hot solder-holding trough being mounted at the extremity of one handle and a pair of fingers over the trough mounted on the other handle.

894,193. Incandescent Lamp. William W. Dean, Chicago, Ill., assignor to the Kellogg Switchboard and Supply Company, Chicago, Ill. Application filed August 9, 1902.

The construction of a small signal lamp with cylindrical bulb for telephone switchboard use is described.

894,199. System of Control for Electric Motors. Ralph M. Gaston, Morgan Park, Ill. Application led November 29, 1907.

In combination with a motor is an electromagnetic circuit-breaker on an auxiliary circuit, a second motor, and means made effective by and at certain periods in the operation of the latter to open and close the auxiliary circuit and thereby set the circuit-breaker in operation.

894,201. Insulator. Thomas E. Hallett, Chicago, Ill. Application filed January 8, 1903.

Into the screw-threaded bore projects a rigid support in contact with the side wall of the bore. A single wedge block is threaded on the outside and placed between the support and the opposite side of the bore.

894,212. Trolley Guard. George S. Keck, Baltimore, Md. Application filed August 12, 1907.

A trolley guard comprises a block to which jaws are mounted so as to swing laterally, means for closing the jaws, a releasing cam, wipers on the jaws, and a pivot about which the block and jaws may be rotated to move the wiper over the cam and open the jaws.

894,214. Telegraphy. Isidor Kitsee, Philadelphia, Pa. Application filed April 24, 1907.

The system is equipped with means to transmit induced true reversals and means to receive the same, the second means comprising a condenser inserted in the line, a shunt therefor, and a polarized receiver in the shunt.

894,215. Process of Extracting Precious Metals from Ores. Isidor Kitsee, Philadelphia, Pa. Application filed August 24, 1907.

The process consists in first electrolyzing a compound containing chlorine and a compound containing nitrogen and then subjecting a metal-bearing ore to the dissolving action of the anolytes of these compounds.

894,217. Electric Railway. Mathias A. Lazareff, New York, N. Y. Application filed February 6, 1907.

A sectional third-rail railway has the sections normally connected to the live conductor except immediately in front of and behind the car.

894,232. Motor-controlling System. Walter J. Richards, Norwood, Ohio, assignor to the Allis-Chalmers Company. Application filed September 29, 1906.

There are provided a number of magnetic clutches for connecting the motor and the driven mechanism together to run at different relative speeds, and a controller for gradually energizing one of the clutch coils and at the same time de-energizing another.

894,233. System of Motor Control. Walter J. Richards, Norwood, Ohio, assignor to the Allis-Chalmers Company. Application filed January 31, 1907.

In this system a main controller is arranged to connect the motor to the source of supply either directly or through a converter, and there are a number of electrically interlocked push buttons for controlling the main controller.

894,237. Means for Charging Storage Batteries. Mary N. Stivers, Jersey City, N. J., administratrix of William D. Stivers, deceased. Application filed March 27, 1907.

A variable resistance in the charging circuit is under the control of a reversible motor in an auxiliary circuit, which is governed by a number of solenoids.

894,238. Accumulator Electrode. Ludwig Strasser, Charlottenburg, Germany. Application filed August 20, 1904.

A plate for a storage battery with an alkaline electrolyte consists of poorly conducting active material to which is added a mass of carbon particles obtained by highly heating organic matter.

894,257 and 894,258. Telephone Apparatus. Arthur M. Cobb, Lynn, Mass. Applications filed November 4, 1907, and January 18, 1908.

This is a head telephone that carries a receiver in contact with the ear of the wearer and a transmitter near his mouth.

894,273. Winding Machine. John H. Lendi and Albert H. Simmons, Chicago, Ill., assignors to the Belden Manufacturing Company, Chicago, Ill. Application filed July 26, 1907.

In a coil-winding machine there is a spool holder having notches in the face thereof to provide clearance for terminal clips mounted upon the head of the spool being wound.

894,283. Electric Stop-motion for Warping Machines. Frederick Ott, South Bethlehem, Pa. Application filed May 9, 1907.

A line conductor crosses the line of movement of a series of pivoted metallic fingers. The threads hold the fingers in such position that only a vitrified portion is in contact with the line conductor until the thread breaks, when uninsulated surface of finger makes contact with line conductor closing an electric circuit operating machine stop-motion.

894,284. Alarm. Edward Pfeifer, Columbus, Ohio. Application filed February 25, 1908.

The alarm is for the purpose of detecting a change in air pressure or the presence of gases of different specific gravity from that of air. Levers carrying air vessels are arranged to close contacts on movement of the vessels due to increased or decreased pressure.

894,304. Fire-alarm Box. Leonidas G. Woolley, Lima, Ohio, assignor to John C. Riley, Lima, Ohio. Application filed August 31, 1906.

The alarm mechanism is set into operation by opening the door. Closing the door supplies energy to the actuating spring.

894,305. Turbo-generator. Alfred H. Wouters, Norwood, Ohio, assignor to the Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed November 3, 1906.

Details of construction of the armature are described.

894,306. Illuminating Sighting Appliance. William H. Wright, Lick Observatory, Cal. Application filed May 18, 1907.

The revolver sight is fitted with a lens. For night work cross-hairs in the focal plane are arranged to be illuminated by a small electric lamp supplied by batteries in the handle.

894,317. Electrode for Electrolytic or Liquid Oscillation Detectors for Wireless Telegraphy. Lee de Forest, New York, N. Y., assignor to the De Forest Radio Telephone Company. Application filed December 21, 1905.

This electrode, which is of the insulation-covered type, comprises a thin flat conducting plate in a duct of insulating material, so that only the thin edge of the end of the plate is exposed from the flush end of the duct.

894,318. Aerophore. Lee de Forest, New York, N. Y., assignor to the De Forest Radio Telephone Company. Application filed December 22, 1905.

An arrangement of transmitting and receiving apparatus for wireless transmission is described, in which there is an automatic device for transmitting signals in a given direction, while a shunt circuit cuts out the responder.

894,323. Electric Water Heater. Frank E. Holt, Vancouver, B. C., Canada. Application filed April 2, 1908.

The heater casing contains a core having transverse partitions through which the water may circulate, and around which the heating elements are wound.

894,326. Electric Switch Register. John H. Jackson, Watonga, Okla. Application filed February 18, 1908.

Movement of the switch-frog through the usual lever serves to depress a push-button, closing an electric bell circuit.

894,329. Electric Generator or Motor. Carlton L. Kennedy, Braintree, Mass. Application filed July 29, 1905.

This direct-current machine has slots in the face of each pole piece, with magnetic shunts for carrying lines of force from the region of the slots around the armature. Brushes are provided at the neutral points produced by the slots.

894,333. Electrically Propelled Vehicle. Joseph Ledwinka, Philadelphia, Pa., assignor to Russell Thayer, Philadelphia, Pa. Application filed May 19, 1906.

The car carries a storage battery as an auxiliary source of supply. A switch mechanism is arranged to effect the change from trolley supply to battery supply when the external power circuit is broken.

894,378. Wireless Signaling Apparatus. Lee de Forest, New York, N. Y., assignor to De Forest Radio Telephone Company. Application filed January 17, 1903.

A number of antennæ are each made syntonic with a wave train of a particular period, while Lecher receiving conductors are each connected to and tuned to the same frequency as the respective antennæ. An indicating means is operative only by all of the wave-responsive devices.

894,382. Contact Switchbox for Electric Railway Systems. Charles A. Huse and John G. Douty, Williamsport, Pa., assignors to the Simplex Surface Contact Company. Application filed September 17, 1907.

A pivoted armature closes a power-contact when attracted by a magnet carried by the car. The switch is apparently designed for surface-contact systems, in which the power rail or contact is not connected until at the approach of the car.

894,388. Toll-collecting Box. George A. Long, Hartford, Conn., assignor to the Gray Telephone Pay Station Company, Hartford, Conn. Application filed June 10, 1907.

The device is applicable to telephone pay stations.

894,435. Electrolytic Apparatus for Purifying Liquids. John T. Harris, New York, N. Y. Application filed July 9, 1906.

The cell is fitted with baffles between the groups of electrodes, which are composed of metals capable of yielding a colloidal hydroxide.

894,460. Telephone Transmitter. Emile J. Pitrat, Urbana, Ill. Application filed June 21, 1907.

By an arrangement of the speaking diaphragm and capsule in a vertical plane, but at right angles to the mouthpiece, the speaking diaphragm is maintained in a vertical position whatever the level of the mouthpiece on its arm. The speaking diaphragm is connected by an elbow lever having unequal arms to magnify the motion on the carbon granules.

894,468. Tank Indicator. Julius E. Smith, North Lansing, Mich. Application filed December 12, 1907.

Valve circuits control the supply of liquid to the tank and are operated by float-contacts. A supplemental bell alarm is provided.

894,471. Railway Signaling. Jacob B. Struble, New York, N. Y., assignor to the Union Switch and Signal Company, Swissvale, Pa. Application filed July 13, 1904.

The track is broken into insulated sections and an arrangement of relays and electromagnets operates visual signals at the presence of a train on the block.

894,476. Railway Safety Appliance. Charles A. Ward, Forestville, Conn. Application filed May 29, 1907.

A third rail is laid along the right-of-way and is supplied with current by an electric generator carried on the locomotive. The third rail is broken into sections and lamps connected to it serve as signals along the track.

894,479. Induction Coil. Amos R. Bliss, Lowell, Mass. Application filed April 13, 1908.

The coil is made up of a number of flat-wound secondary units, which fit over the primary and core.

894,487. Primary Battery. Eben G. Dodge, Newark, N. J. Application filed April 29, 1907.

In this voltaic battery a plate of copper oxide is supported by an inverted U-shaped hanger. The hanger arms are connected by a cross-piece carrying, but insulated from a pair of zinc plates.

894,499. Instrument for Comparing and Measuring Rays of Light. Carl G. Hinrichs, St. Louis, Mo. Application filed October 25, 1907.

This photometer contains a fluorescent substance, on which the light from the two sources to be compared impinges.

894,518. Lightning Arrester. Maurice Milch, Nagy Bittse, Austria-Hungary, assignor to the General Electric Company, Schenectady, N. Y. Application filed January 16, 1907.

This arrester differs from the usual arrangement of air gaps in having the arcing surface on one side of the gaps of one material and on the other side of a different material to permit the passage of current more easily in one direction than in the other. A second group is arranged in parallel with the first group to permit the flow of current more easily in the reverse direction.

894,522. Voltage-regulating System. Wilbur L. Merrill, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed October 27, 1906.

Regulation is effected by relays connecting into circuit counter-electromotive-force generators arranged with rheostats for adjusting their respective field strengths.

894,533. Dynamo-electric Machine. Henry G. Reist, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed November 11, 1907.

The binding band is a metal strip having holes therein, and rows of clips formed integrally therewith, so that the clips act as fan blades.

894,539. Regulation for Multiphase Systems. Edward Schildhauer, Washington, D. C., and Albert A. Radtke, Chicago, Ill. Application filed February 8, 1907.

With the main generator and phase branches leading therefrom are combined a number of synchronous machines whose armatures are mechanically connected together so that the machines may operate either as motors or generators to co-operate to maintain equal load on the phase branches. The field frames of the machines may be adjusted to the desired electrical angle with respect to the armatures.

894,547. Apparatus for Manufacturing Nitrous Compounds. Charles P. Steinmetz, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed March 19, 1907.

The burning-chamber arrangement provides for the arcs to be drawn between stationary electrodes and moving electrodes carried on rotating arms. Alternating current is used through step-up transformers. The moving contacts may be arranged on the generator shaft so that the arcs will be made and broken in the order of succession of the phases of the generator.

894,563. Starting Rheostat. William C. Yates and George W. Cravens, Schenectady, N. Y., assignors to the General Electric Company, Schenectady, N. Y. Application filed November 9, 1905.

The starting switch has a bias to an off position between its starting and running positions. The bias is changed to the running position as it is moved toward the starting position.

894,564. Rheostat. William C. Yates, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed December 10, 1907.

The bias of the controlling arm to an initial position is removed by a no-voltage magnet.

894,565. Rheostat. Paul H. Zimmer, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed December 26, 1907.

The controller arm is unlocked from its full-speed position on the occurrence of an overload.

894,591. Semaphore Signal. Walter W. Brown and Arba G. Clark, Schenectady, N. Y., assignors to the General Electric Company, Schenectady, N. Y. Application filed March 21, 1907.

The semaphore signal is electrically driven and contains contacts indicating its position.

894,592. Wire-coating Machine. John G. Callan, Lynn, Mass., assignor to the General Electric Company, Schenectady, N. Y. Application filed May 9, 1905.

The coating is applied by passing the wire vertically over wheels on a movable coating rack, and afterward carrying the conductor through ovens.

894,593. Wire-stringing Device. John G. Callan, Nahant, Mass., assignor to the General Electric Company, Schenectady, N. Y. Application filed September 16, 1907.

The wire-stringing device comprises an endless belt and a number of sheaves each consisting of a grooved wheel and a cone pulley adjacent to each other and mounted for independent rotation.

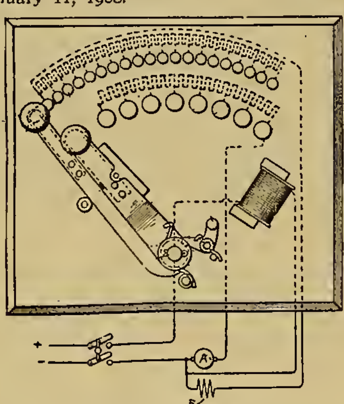
894,602. Secondary or Storage Battery. Charles H. Clare, Stratham, N. H. Application filed September 28, 1907.

Ducts extend through the electrodes to allow the electrolyte to circulate freely in contact with a larger electrode area.

894,613. Process of Insulating Electric Conductors. John T. H. Dempster, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed November 6, 1907.

The process in particular applies to insulating an alloy containing chromium and iron, by oxidizing the surface to produce a coating and then treating to remove the conducting oxide.

894,614. Rheostat. George H. Dorgeloh, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed January 11, 1908.



No. 894,614.—RHEOSTAT

The armature supply circuit through the rheostat must be short-circuited before the field-resistance arm for speed variation may be operated. (See cut.)

894,616. Insulator and Wire Clamp. John L. Fay, St. Louis, Mo. Application filed September 19, 1907.

The insulator is arranged to clamp the conductor firmly by means of a threaded set-screw.

894,620. Transformer. John J. Frank, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed October 21, 1907.

This current-transforming device comprises a step-up transformer having its primary and secondary windings in close inductive relation, and a step-down transformer connected in series therewith and having its primary and secondary windings spaced apart to secure proper insulation between them.

894,622. Gas and Gasoline Engine. Anthony Fricker, Pittsburg, Pa. Application filed October 24, 1906.

The ignition circuit is controlled by contacts operated in connection with the valve motion.

894,624. Magneto-electric Generator. Louis A. Gianoli, Paris, and Raoul A. Persin, Villiers-le-Bel, France, assignors to said Louis A. Gianoli, Paris, France. Application filed April 12, 1905.

The rotatable core carries both a primary and secondary winding and a breaker, which is operated automatically by the attraction of the magnetic flux of the core due to its rotation.

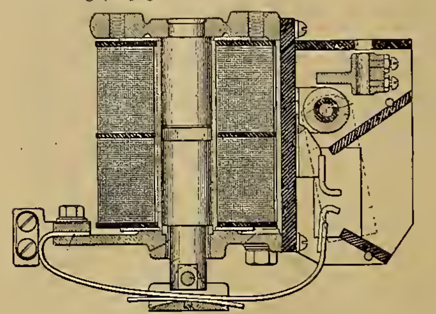
894,625. Incandescent Lamp. Emery G. Gilson, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application December 22, 1906.

Tapering metal closures in the stem are held in close contact with the filament by rings.

894,637. Trolley Contact. Laurence A. Hawkins, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed December 31, 1907.

The contact is a long, thin, flexible strip above the trolley wire and arranged to be engaged by the rims of the trolley wheel in passing.

894,643. Contactor. George H. Hill, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed December 31, 1903.



No. 894,643.—CONTACTOR

The movable contact finger of spring-conducting material, rigidly fastened at one end, passes loosely through a stirrup on a rod, which controls the contact of the finger on a bearing plate. (See cut.)

894,644. Bus-line Coupling Socket. George H. Hill, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed October 1, 1904.

The coupler head comprises a body of insulating material having a socket containing a terminal, separated metallic caps on and covering the ends of the body portion, a conductor passing through one of the caps, and an insulating compound surrounding the conductor.

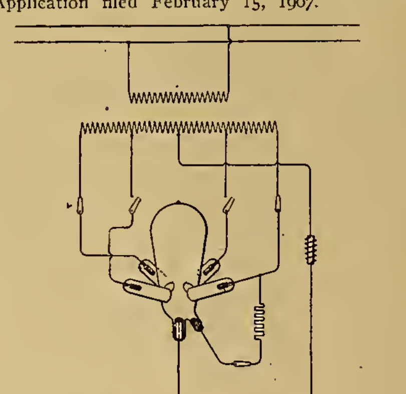
894,645. Contactor. George H. Hill, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed February 9, 1906.

The engaging-contact surface does not share in the operation of breaking the circuit. When the switch opens a rocking action brings the inner ends of the contacts into engagement and separates the tips.

894,651. Meter. Charles E. Holmes, Lynn, Mass., assignor to the General Electric Company, Schenectady, N. Y. Application filed May 6, 1905.

By the construction of the meter the parts automatically make contact when the elements are moved into place.

894,668. System of Electrical Distribution. Osias O. Kruh, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed February 15, 1907.



No. 894,668.—ELECTRICAL DISTRIBUTION

A mercury-vapor rectifier has a number of pairs of anodes and a cathode. The voltage of the load current may be materially varied by shifting the arc of the rectifier from one pair of anodes to another. (See cut.)

894,703. Flush Receptacle and Plug. Frank W. Sanford, Schenectady N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed September 12, 1905.

The receptacle has a shutter yieldingly supported in its closed position.

894,704. Combined Fuse Box and Receptacle. Howard R. Sargent, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed October 1, 1907.

On a base-plate having at one end a thicker portion containing a socket are clips serving to hold the cover in place. Removable fuses are held in the clips on the cover.

894,705. Protective Device. Ernest Schattner, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed June 10, 1905.

A shunt connection has a section of resistance material of negative temperature coefficient.

894,714. Variable-voltage Transformer. Mercer G. Young, Pittsfield, Mass., assignor to the General Electric Company, Schenectady, N. Y. Application filed December 26, 1907.

The variable-voltage transformer has a three-legged core with the primary winding surrounding one leg. A secondary winding surrounds the leg carrying the primary winding and a second leg. The flux due to the primary winding is sent through the other two legs alternately. An independent coil surrounds the leg surrounded by the secondary winding, but not the primary winding, and is short-circuited through a second coil, whose reactance may be varied.

894,720. Method of Forming Rail Bonds. Eugene M. Bournonville, Jersey City, N. J., assignor to the Davis-Bournonville Acetylene Development Company, Jersey City, N. J. Original application filed September 20, 1907. Divided and this application filed December 30, 1907.

Both surfaces are first heated to a point slightly below the melting temperature, and molten material is applied until the parts unite.

894,723. Arrester. Albert B. Chance, Centralia, Mo. Application filed September 12, 1906.

This consists of a longitudinally-bored non-conducting body on which is coiled a wire. The whole is enclosed in a tubular metallic casing to which the ground wire is connected.

894,760. Trolley Base. Charles M. Stokes and William F. Ensor, Bradford, Pa., assignors of one-third to John W. Barnes, Bradford, Pa. Application filed September 23, 1907.

The spring is enclosed in a tubular casing, and is provided with an adjustable abutment at the outer end.

894,766. Means for Operating Vapor Electric Lamps. Ezechiel Weintraub, Schenectady, N. Y., assignor to General Electric Company, Schenectady, N. Y. Filed December 26, 1902.

A series of vapor electric lamps, supplied by a constant potential source of current, is fitted with a resistance in shunt to each lamp, a cut-out having its contacts in the circuit of the resistance and its energizing coil in circuit with the lamp. Current-limiting means are permanently in series with the circuit of the lamps.

894,775. Sparking Device for Explosive Engines. Charles R. Greuter, Wilkesbarre, Pa., assignor to the Matheson Motor Car Company, Wilkesbarre, Pa. Application filed April 25, 1907.

The patent describes details of construction of an electric car ignition system for explosive engines.

894,782. Electromechanical Device. George H. Rowe, Riverside, Ill., assignor of one-half to William H. Johnson, Glencoe, Ill. Application filed October 15, 1906.

The reciprocating member is adapted to impart a blow to a stationary object, cushioning the blow by means of an electromagnet and an armature.

894,783. Branch Block. Howard R. Sargent, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed July 13, 1906.

An electrical fitting for leading off branch taps has grooves for the line wires with conductors and fuse receptacles adapted to be connected thereto.

894,800. Power-translating Apparatus. Joseph Sachs, Hartford, Conn. Original application filed September 19, 1903. Divided and this application filed July 2, 1904.

For an electric vehicle a motor armature and a generator armature rotate in the same field magnetic circuit. A clutch is arranged so that the driven member is always operated through the shaft of the motor armature.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired August 4, 1908:

456,940. Electromagnetic Cut-out. S. H. Cobb, Hyde Park, Mass.

456,970. Car Propelled by Electricity. S. H. Short, Cleveland, Ohio.

456,979. System of Conducting Electric Currents. E. Britt, Davenport, Iowa.

457,015. Trolley for Electric Railways. S. H. Short, Cleveland, Ohio.

457,016. Electric Car Brake. E. Verstraete, St. Louis, Mo.

457,030. Electric Clock. W. K. Menns and W. J. Dudley, Everett, Mass.

457,058. Electric Track Signal. M. W. Parrish, Detroit, Mich.

457,067. Electric Car Brake. C. R. Arnold, Sharon Hill, Pa.

457,102. Electric-railway Motor. N. C. Bassett, Lynn, Mass.

457,106. Electric Conductor. E. M. Boynton, West Newbury, Mass.

457,110. Mechanical Switch for Electric Systems. C. Dauffenbach, Milwaukee, Wis.

457,116. Galvanic Battery. J. R. Hard, New York, N. Y.

457,141. Electric Arc Lamp. X. Wertz, New York, N. Y.

457,164. Electric Smoothing Iron. W. Mitchell, Malden, Mass.

457,226. Brush-holder for Dynamo-electric Machines. S. H. Short, Cleveland, Ohio.

457,239. Printing Telegraph. H. Van Hoevenbergh, Elizabeth, N. J.

457,240. Electric Railway. S. E. Wheatley and J. W. Schlosser, Washington, D. C.

457,300. Electric Switch. W. C. Bryant, Bridgeport, Conn.

457,301. Electric Switch. L. D. Castor, Philadelphia, Pa.

457,330. Automatic Brush-shifter for Dynamo-electric Machines. T. E. Adams, Cleveland, Ohio.

WESTERN ELECTRICIAN

EVERY SATURDAY

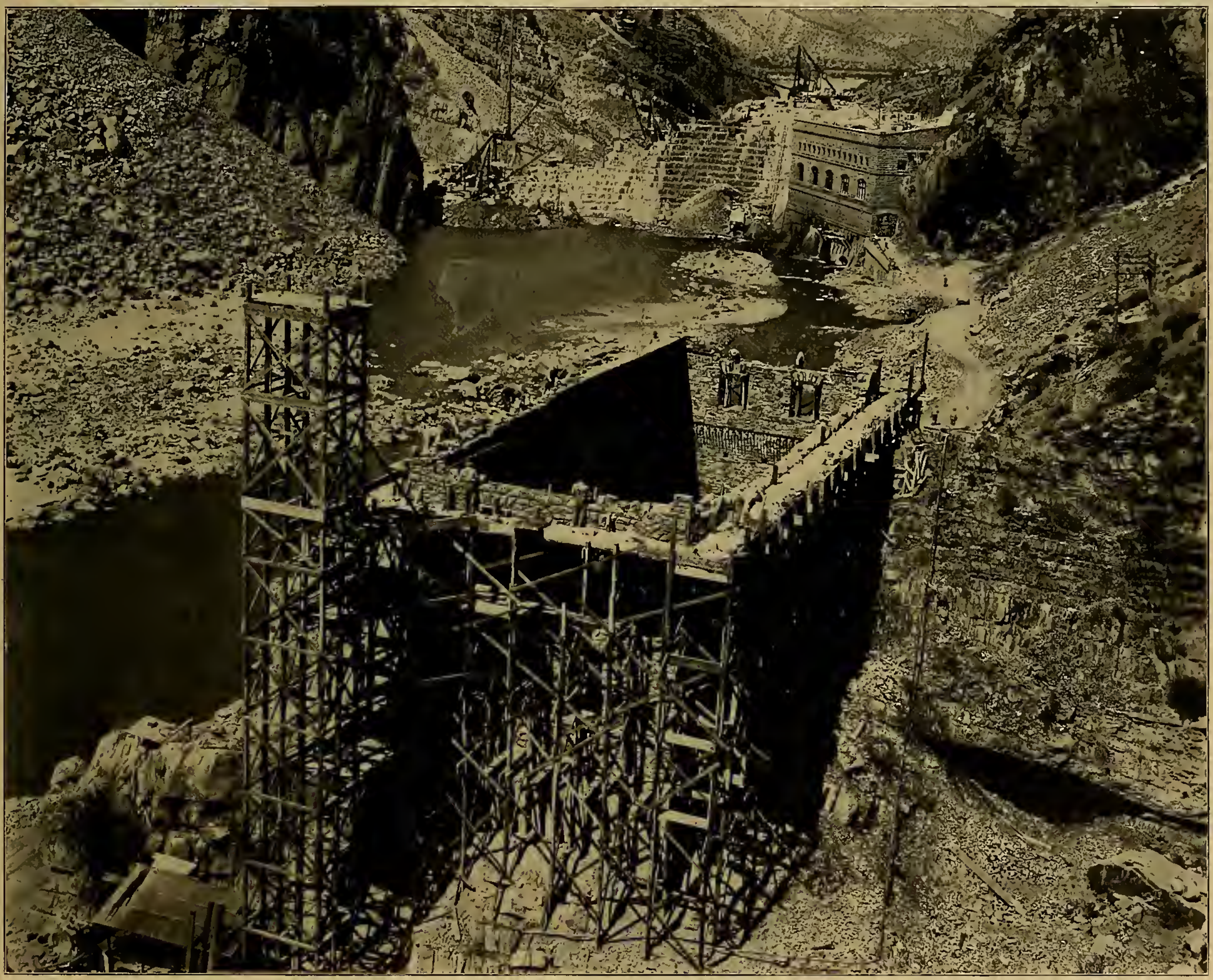
Vol. XLIII. CHICAGO, AUGUST 15, 1908 No. 7

POWER DEVELOPMENT FROM SALT RIVER IRRIGATION PROJECT IN ARIZONA

In carrying out the great works of irrigation which the United States Reclamation Service is executing to benefit the arid lands of the West, the government's engineers have found the utilization of waterpowers important to the distribution of the water by pumping. One of the most interesting of these is the Salt River project in be a roadway 20 feet wide. The dam will create a reservoir having a superficial area of 16,300 acres, or 25.5 square miles.

This storage capacity is sufficient to flood 1,300,000 acres to an average depth of one foot and represents a volume greater than that held by the greatest Nile dam. The supply from the Salt and Verde rivers drains a watershed of 6,260 square miles. The average yearly rainfall in this region is less than 20 inches, and in the territory to be irrigated less than three to nine inches. Evaporawhich was cut by the cliff-dwellers out of the solid rock with their crude instruments of stone.

The power-development scheme contemplates the diversion of water from the Salt River by means of a diversion dam, shown in one of the pictures. From the intake, pictured plainly with its control gates in the same view, the water is led through a concrete-lined power canal 18.5 miles long, having a capacity of 220 second-feet, along the edge of the Roosevelt or Salt River reservoir site and along the side of the canyon paralleling the high-



This Photograph, Taken Last Month, Shows the Roosevelt Dam in Construction, the Power House and (in the Foreground) the Transformer House
POWER DEVELOPMENT FROM SALT RIVER IRRIGATION PROJECT IN ARIZONA

Arizona, which contemplates using the waterpower created to operate irrigation pumps fully 60 miles distant from the source of power.

The great hydraulic work at Salt River is going forward to rapid completion, as the accompanying recent photographs testify. Besides the irrigation work, the development includes a hydro-electric power plant of 4,400 horsepower at the Roosevelt dam, below the Salt River reservoir. The Roosevelt dam is about 55 miles northeast of the city of Phœnix, Ariz., and the energy developed by the plant will be transmitted to pumping stations to be built near the city in the future. The map given on the next page shows the topography of the region.

The Roosevelt dam is one of the world's greatest engineering feats in process of construction. When finished this wonderful buttress of cement and sandstone will rise 284 feet above the river. Its total length at the top will be 1,080 feet and its thickness at the base 170 feet. Its base will cover an acre of ground. Across the crest will tion is rapid in the summer temperature, often 120°, although the altitude is between 1,000 to 1,200 feet above sea level. The soil is rich and productive when irrigated. The dam will be completed in 1909. Forty miles below the dam the water is to be diverted by means of a low dam into the main stems of a system of canals, one on each side of the river, and covering about 160,000 acres of land in the vicinity of Phœnix and Mesa.

When the big iron gates are at last closed the present site of the city of Roosevelt will be flooded under a depth of 220 feet. The little town which must be given up when the dam is finished is a typical Arizona village with dwelling houses and stores, a school and a church. The ultimate fate of the spot was known when the town was first projected. The Salt River Valley has been the home of three races, and relics of the old cliff-dwellers are in sight of the dam. One of the canals which leads from the irrigation dam 60 miles below Roosevelt follows in part a channel line Phœnix-Roosevelt road. A photograph gives a characteristic view of this concrete-lined flume.

In some places, on account of the topography of the line, the flume water is led through penstock tunnels (aggregating 10,000 feet in length) under ridges, where the construction of an open ditch would prove too expensive or difficult. The completed cost of the canal was $1,000,000.

Finally, the canal water is to be led through the Roosevelt dam to the power house (seen in the picture on this page) at the side of the unfinished buttress wall. Here waterwheels and electric generators utilize the drop of 226 feet, generating electricity which will be used to operate irrigation pumps at an average distance of 60 miles.

The complete hydraulic equipment of the Roosevelt power house will comprise three 1,260-horsepower turbine waterwheels, operating at 500 revolutions per minute under 226-foot head, and one 140-horsepower turbine waterwheel, operating at 1,000 revolutions per minute under 226-foot head. These waterwheels are equipped with automatic governors and will be controlled by four-foot and 18-inch gate valves, mechanically or hydraulically operated, and designed to withstand the pressure of a head of water of 210 feet.

The waterpower will eventually be drawn from two sources, one having a constant head of 226 feet, the canal line described, and the other taken from the reservoir, which may vary in height from 210 to 80 feet. Both heads operate at the power plant with a draft tube of about 20 feet. It is proposed eventually to place three units on each of these sources.

36 transformers, aggregating 10,530 kilowatts, for the Salt River irrigation project, was described in the Western Electrician of last week. The manufacturers were under severe requirements as to insulation, operating characteristics, etc., and also under rigid stipulations as to prompt delivery. The recent shipment comprises six 350-kilowatt, 25-cycle, 2,300-26,000-volt step-up transformers and nine 235-kilowatt, 25-cycle, 23,100-1,100-volt step-down transformers. The design of the transformers required dealing with certain special conditions at the places of installation, among which were the

break switch (hand operated and fitted with overload relay and trip coil) and field-circuit switch. The exciter panels are to be provided with the usual ammeter and voltmeter, knife switch and fuses. A detailed description of the switching equipment will be given in a later issue.

As noted, the transmission line will be about 60 miles in length, operating at 40,000 volts. In a photograph reproduced herewith is shown a view of the steel towers used. These towers are assembled and then raised into place and bolted to the anchor plates, which are set in the ground.

SKETCH MAP OF SALT RIVER IRRIGATION PROJECT, ARIZONA

The pressure main consists of an inclined tunnel, concrete-lined, on a grade of 40 feet in 100. This terminates in a horizontal tunnel which joins the incline tube with a curve of 50-foot radius through an angle of 48 degrees. The inside diameter of the finished work will be seven feet. From the top down to a point representing about 90-foot head this tunnel will be lined with concrete. Below that point the concrete is to be lined with three-sixteenths-inch and one-fourth-inch steel in the straight portion, and five-sixteenths-inch steel in the curve. For 61 feet extending to the portal and from there into the power house proper will be five-eighths-inch steel, butt and strap-riveted pipe. All of this steel is backed with well-tamped concrete, made with fine broken stone.

Single-runner types of turbine waterwheels are to be used, and they will be controlled by wicket or swivel valves. The normal capacity, 1,260 horsepower, is stipulated to be carried at the highest efficiency and with the control gate three-fourths open. The combined weight of the waterwheel and the revolving field of the generator (the latter part alone weighing about 10 tons) is to be borne on a water-lift bearing operated by the same head as the waterwheel. The guide bearing is oil-lubricated.

It is a characteristic of the water supplied to this plant that it contains common salt in solution, there being about 800 parts to the million. It is accordingly necessary that the removable parts which come in contact with the stream should be designed against this rust-provoking solution. The draft tube is a concrete-lined well in the solid sandstone formation. This well terminates in a tube submerged in the water of the tailrace tunnel.

The electrical units will generate three-phase, 60-cycle current at 2,300 volts and the transmission line will operate at about 40,000 volts. The transformers will be located in a separate house, shown partly completed in the foreground of the picture on page 111, and situated about 600 feet down the river from the power house.

An initial shipment of water-cooled power transformers, forming part of an ultimate equipment of

limited space for handling the transformers in the power house and the high temperature of the cooling water, due to the hot climate of the desert region. The water is circulated through the cooling coil of each transformer by a Wagner three-phase motor-driven triplex pump.

The 900-kilowatt generators will be of the re-

HAULING MACHINERY TO THE POWER HOUSE AT ROOSEVELT DAM

volving-field type, with a vertical shaft. There will be only a single unit installed immediately following the completion of the power house, but the exciter equipment will be put in at once with a capacity sufficient to serve the entire future complement of three machines. The exciter-generator, which is to furnish 100 kilowatts of direct current at 125 volts, must also maintain full voltage at two-thirds speed.

Switchboard apparatus at first installed will consist of a temporary single generator panel and the exciter panel. For the generator panel the following instruments and switches are specified: Polyphase indicating wattmeter, load ammeter, field (direct-current) ammeter, alternating-current voltmeter reading to 125 volts with 20 to 1 ratio potential transformer, synchroscope, triple-pole oil-

The line passes through an arid country covered with cactus and low bushes. The transmission right-of-way has been cleared of all growth for a strip 50 feet in width. The sub-station equipment will be in small units, no pumping-motor unit exceeding 50 horsepower.

One of the first parts of the work to be completed was the power canal, and it is at present utilized to supply waterwheels driving generators developing 1,500 horsepower. From this temporary power station current is supplied to operate the machinery of the cement mill, which grinds material taken out of a limestone ledge nearby into a good grade of cement to be used on the work. Other uses of electrical power during construction are for the stone-crusher, the aerial tramway and the lighting system. The force of the water under 250-foot head is used directly in nozzles of 11 inches to wash away the loose stone material above the bedrock. The gravel so secured is used in the construction.

The cement mill has a capacity of 10,000 barrels a month, and the product is manufactured at a cost of $2.25 per barrel. The dam alone will require 240,000 barrels of cement. When the dam is completed the cement mills will be stripped of all valuable machinery and discarded, as they will be covered by many feet of water.

The lands served by this irrigation project surround the capital of the territory, Phœnix, and are situated in what is known as the Salt River Valley, which has a length east and west of about 40 miles and a width varying from 15 to 30 miles, all within Maricopa County. The soil is an alluvial deposit of great fertility and adapted to the cultivation of a wide variety of crops, including those of the temperate and sub-tropical zones. The lands under the project are mainly in private ownership, but there are many large holdings, which must be subdivided and sold to actual settlers. The landowners under the project have organized the Salt River Valley Water Users' Association, and requests for information relative to lands, crops and climate should be addressed to its president at

Phœnix, or to the president of the Board of Trade at Phœnix.

O. H. Ensign is the electrical engineer of the United States Reclamation Service in charge of specifications for the Salt River project power machinery. His office is in the Pacific Electrical Building, Los Angeles, Cal. C. H. Fitch is acting director of the Reclamation Service, which is a bureau of the Department of the Interior at Washington.

WATERFALLS IN MEXICO

The utilizing of the waterfalls in different parts of Mexico for the generation of electric power is one of the most important factors in the civic and industrial development of the country. Many of the waterfalls in Mexico are now owned by Americans, who expect, in course of time, to put them to use in hydro-electric enterprises. The falls on the El Duro River, in the state of Michoacan, are now generating 12,000-horsepower of electrical energy. The Necaxa Falls, situated about 100 miles from the City of Mexico, will be generating 40,000 horsepower when the great hydro-electric enterprise which is now being constructed there is finished.

Some of the waterfalls in the mountains of Mexico are of great height and of large volume. In the southern part of the state of Vera Cruz are to be found those of Barrio Nuevo, Atoyac, Escandio and Eltiyantla, the last named being 1,600 feet high; also the falls of Rincon Grande, Naolinco, Orduna, Tupango, Palechan, Teneximaxcac, Omealca, Chiquihuite, Calichal and Las Inditas.

In the state of Jalisco are the celebrated falls of Juanacatlan, which are called the Niagara of Mexico. These falls are among the most beautiful of the republic. They are about 70 feet in height by 500 feet in width.

The most famous falls in the state of Michoacan are the Naranjos, Tzararacua (140 feet high), Camela, Salto de En Media and Baral, the last named being 330 feet high.

In the state of Hidalgo the most important are the La Regia, Manteco, Ixcatran, Arzopil, Carmen, Tlapacoya, Bandola, Cuatlaxingo, Nonoalco, Mapachaco, Toxtamantla, Tolantonggo, Tijiapan and Campo Santo.

In the state of Puebla are the famous Nexcaca or Huachinango falls, 420 feet high.

In the state of Morelos are the San Anton, El Taxco and El Salto falls.

In the state of Tlaxcala are the San Diego falls.

In the state of San Luis Potosi are the El Salto (245 feet high), Platanar Gallinas (98 feet high) and Pinihuana falls (142 feet high).

In the state of Mexico the most important falls are El Salitre, San Gaspar, Puente de Dios (210 feet high), San Simon and Santa Anam (140 feet high).

There are also other important falls in the Sierra Occidental and Oriental.

LIGHTNING SETS OFF BLAST

Twenty-six tons of dynamite exploded prematurely after the charge had been arranged and connected up with electric wires at Caimito Mulato in the Chagres division of the Canal Zone recently. The batteries had not been connected and the powdermen were waiting for the laborers to quit work at 5 o'clock when lightning struck the wires during a brief thunderstorm that arose suddenly. Two Americans were killed, several laborers were injured and several hundred men in the vicinity had narrow escapes.

ELECTION RETURNS BY ELECTRIC SIGN

Partial returns from the primary elections held in Illinois last Saturday were announced to thousands of people in the Loop district of Chicago the same evening through the medium of a large electric "talking sign" erected by the Chicago Daily Tribune for the purpose on the roof of a building at State and Randolph streets. The big sign was arranged in four lines, with 15 spaces to each line. Each space was three feet high and 2½ feet wide, and each served as a letter or figure, as the operator who controlled the electric connections desired.

The characters were controlled by a mechanism like an ordinary typewriter keyboard. As the returns came in they were telephoned directly to the operator, who sat under the sign. The bulletin was then written on the keyboard, the keys controlling a group of electrical connections. The letter spaces were made up of the usual universal letter boxes with 25 lights each.

On an average the bulletins were changed once every 60 seconds, and followed closely the progress of the count on the returns for governor, United States senator and state's attorney, the minor contests being recorded by less frequent bulletins. Now and then, as the returns came in unusually fast, the operator established a record by changing his entire sign in 45 seconds.

This electric sign writer attracted considerable attention when it was first exhibited at the Chicago Electrical Show of last January. A description of its operation was given on page 76 of the Western Electrician of January 25th.

DIVERSION DAM AND POWER-CANAL INTAKE ON SALT RIVER ABOVE ROOSEVELT RESERVOIR

ELECTRIC-LIGHT MOTH TRAP

To protect the trees of Central Europe from the ravages of moths which swarm from Russia, an inventor on the Continent has devised an electric-light insect trap.

The contrivance consists of two large and powerful reflectors placed over a deep receptacle and powerful exhaust fans. At night two great beams of light are thrown from the reflectors on the wooded mountain sides.

The results are reported to have been astonishing. The moths—which lay the eggs from which the caterpillars come—drawn by the brilliancy, come fluttering in thousands along the broad rays of light. When they get within a certain distance of the reflectors the exhaust fans take up their work, and, with powerful currents of air, swirl the bugs down into the receptacle.

It is said that the authorities of the German kingdom of Saxony have taken up the light trap to fight the caterpillar plague which is denuding the forests, and have set up the apparatus on the roof of the municipal electric station at Zetton. On the first night it is asserted that three tons of moths were caught. It has been decided to build another trap on the Rathaus tower, and the fight will be continued. The splendid pines of the Lausitz Mountains are this year threatened with destruction.

WHOLESALE CURRENT SUPPLY IN FRANCE

The new 25,000-kilowatt steam-turbine plant which has been lately erected in the north of France will be one of the largest on the Continent. It is designed to supply the important industrial district which includes the three manufacturing centers of Lillé, Roubaix and Tourcoing. A large plant was much needed here, as before this there were but

PORTION OF CONCRETE-LINED POWER CANAL TO ROOSEVELT POWER HOUSE

a few separate stations. The three towns have extended so that the whole may be said to form one large city.

Current will be sold for various purposes. Two important customers will be the Roubaix-Tourcoing Tramway Company and the Lillé-Roubaix-Tourcoing Electric Company. The station is well situated at Wasquehall, in the center of the district, and at a maximum distance of four miles from the center of each of the three cities. The erection of the plant was begun in September, 1906, and it was put in operation last October. Since that time, however, the installation has been considerably extended.

An area of 22,000 square meters is now occupied by the station grounds, and these are located near the Marcq Canal. Coal boats come by the canal and are unloaded at the station, and the coal can also be brought to the plant by railroad. An electric crane takes the coal from the cars or boats and loads it onto an electric car, which then drops it within the station yard, where there are a number of tracks arranged so as to allow of storing 10,000 tons of coal. Such a reserve supply will forestall the freezing of the canal or coal miners' strikes.

The main building of the station has three rooms lying side by side. In the first of these are placed the boilers. In the second are located the piping

STEEL TOWERS FOR TRANSMISSION LINE FROM ROOSEVELT POWER HOUSE

and the different pumps, while the third hall contains the steam turbine and alternator groups, with their condensers, as well as the exciter sets. Here are also placed the rotary converters which serve to furnish direct current for the traction and lighting circuits. Owing to the ground formation, a foundation for the whole area of the building was laid in reinforced concrete three feet thick. There are seven turbo-alternators in operation. The lines are run on the three-phase, 10,000-volt system, with transformer posts at different points.

INTERNAL-FIELD SINGLE-PHASE SERIES MOTOR

Single-phase motors have heretofore been subject to a number of serious disadvantages, as compared to the direct-current motor. Their power factor is low, owing to the comparatively great inductance of the field and armature coils of the motor. Because of this inductance, the current lags far behind the electromotive force supplied, and must reach much greater values to correspond to a certain horsepower developed in the motor, which necessitates the use of transmission wires of greater cross-section than if the power factor were good. The weight of the alternating-current motor is also much greater for a certain power rating than of the direct-current motor. This is due to the fact that lower flux densities are employed in the iron of the alternating-current motor than in the direct-current motor to reduce the core losses. As more iron must be employed in the alternating than in the direct-current motor, and, as the space on an electric car which can be devoted to a motor is limited by height of the floor, the horsepower of alternating-current motors of this type for such purposes has been limited as compared with the direct-current motor.

To secure a reduction in size and weight of this class of motors without impairing their power rating and efficiency was the motive that prompted the invention of a new type by Stanley S. Seyfer of South Bethlehem, Pa. Prof. William S. Franklin of Lehigh University has a one-half interest in the patent on this type of motor.

In the series motor for alternating currents, when the machine is running, a certain portion of the electromotive force of supply is used in overcoming the impedance of the field, another portion in overcoming that of the armature, while the remainder balances the counter-electromotive force induced in the armature by rotation. If a short-circuited winding be placed on the field so as to act as a short-circuited secondary with the armature coils as primary, the inductance of the armature can, with the exception of the small amount due to leakage of flux, be counteracted. Such a short-circuited secondary is termed a compensating winding, and the armature coacting therewith is termed a compensated armature.

In order to make the power factor as large as possible, the lag angle must be reduced as much as possible. This may be done by decreasing the inductance of the field coils or by decreasing the armature inductance. The armature inductance, having already been reduced by the compensating windings, is very small in amount, and, therefore, improvement must take the direction of reducing the field inductance.

Since the power of the motor is proportional to the product of the field strength by the armature ampere turns, one way to better the power factor of the motor is to weaken the field (so as to get less inductive drop) and strengthen the armature (strengthening the armature involving no disadvantage, since its induction may be compensated). With a certain diameter of rotating armature, as universally used in these motors, the only way to increase the armature ampere turns is to deepen the slots in the armature core, but, as the slots approach each other as they are extended toward the center of the core (the slots lying in a radial direction) they cannot be materially deepened beyond present practice, without their being run together and cutting off the teeth formed between them. Therefore, it is impracticable to increase the armature ampere turns by deepening the slots on the single-phase motors as ordinarily used.

A third way in which the power factor can be increased is by increasing the counter-electromotive force. The induced counter-electromotive force is the most important element in determining the power factor of the motor when running, since it is always in phase with the current, and the power factor would be unity if the counter-electromotive force were the only one acting. The greater this force is, as compared with the electromotive force lost by inductance, the better the power factor of the motor. Therefore the power factor can be increased by increasing the induced counter-electromotive force. This may be done either by strengthening the field, or by increasing the number of turns on the armature. The first method is impracticable, because strengthening the field would increase the inductive drop in the field correspondingly, so that nothing would be gained. The second method, namely strengthening the armature, is unobjectionable, since the armature may be compensated and the increased inductance counteracted. This method is, however, impracticable, except to a limited extent with alternating-current motors as heretofore constructed, because, as has been stated, it can only be done with an armature of a given size by deepening the slots in the armature core, and that would result in cutting off the teeth between the slots.

In the case of an alternating-current motor, then, a weak field is desired, as compared to the armature. This is diametrically the opposite of what is desired in a direct-current motor, where a strong field and a weak armature are required, so as to avoid armature reaction as much as possible.

Single-phase alternating-current motors of the commutator type have generally been built with internal armatures and stationary external fields. Compensated alternating-current motors also have been built with internal armatures. It has been found by the inventor that the power factor of a single-phase motor can be very advantageously increased by changing the relative positions of the field and armature, making the field the rotating member, and the armature the stationary member, with other necessary alterations, whereby a remarkable increase of efficiency, without increase in weight, can be obtained. The changing of the relative positions of field and armature in the alternating-current commutating motor produces advantages which belong solely to this class of motor.

In carrying the invention into practice, there is provided, as illustrated in Figs. 1 and 2, a stationary armature core *I*, consisting of sheet-metal disks or laminations. The disks are secured to the casing *K* by dovetail slots *i* which engage dovetails on the casing. The casing is provided with openings *k'* through which heat may radiate from the armature core. The armature core is provided with slots i^2, which are adapted to receive the armature bars *L*. As these slots radiate outward from their entrances, it is evident that the teeth between the slots increase in cross-section, instead of decreasing in cross-section in the direction toward the bottom of the slots, so that the flux density in the teeth is nowhere greater than at their ends. A shaft *M* is mounted in bearings in the casing and carries a rotating field *N*.

In Fig. 1 the upper half of the field is shown in cross-section, while the lower half is shown in elevation. The field is laminated in the usual way, and is provided with the usual field coils *P*. Bars *Q* are set in slots in the field core and are provided with connections *R* to form compensating windings for counteracting the inductance of the armature.

Current is communicated to the motor and taken from it through brushes *S* which bear upon collector rings *T* (there being four rings and brushes in the case of a repulsion motor, and two in the case of a series motor). The collector rings are mounted upon a disk *U*, that is carried by the shaft, and they have connections *V* with brush-holders *W* that are mounted upon the shaft and rotate with the field, carrying the brushes *X*. In the instance chosen for illustration, two of the rings *T* correspond to the brush leads, while the other two correspond to the field terminals. The brushes rotate within an internal commutator consisting of bars *Y*, which are clamped between plates *Z* by bolts *A'*. The commutator bars are connected with the armature coils by special means, the object of which is to overcome the objectionable sparking under the brushes at the face of the commutator.

In Fig. 3 the windings are supposed to be connected in series, and therefore but two rings *T* of each set are supplied with brushes, the remaining two rings of each set being connected together by a bridge piece *N'*. The large ring *K'* represents the commutator of the armature. The coil *L'* within the large ring represents the field. The concentric rings *M'* at the center of the diagram represent the collector rings *T*, and the two concentric rings *O'* represent the source of supply.

In Fig. 4 the connections are illustrated when the machine is operated as a repulsion motor, each of the four rings *M'* being supplied with a brush. The conventions of this diagram are the same as those illustrated in Fig. 3, and it will be noted that the bridge piece *N'* is omitted; the source of supply *O'* is connected to the brushes connected with the field, while the commutator brushes are connected with a resistance *P'*, so that a circuit of

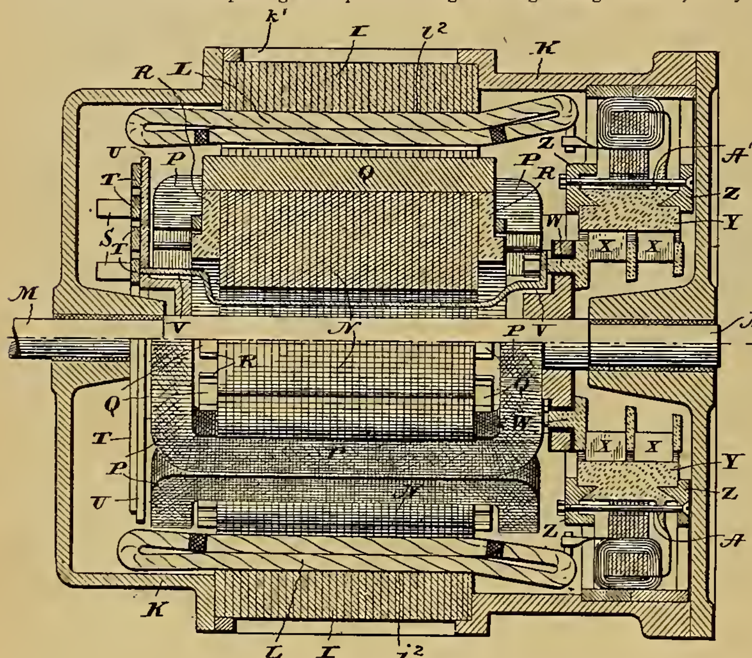


Fig. 1. Longitudinal Section

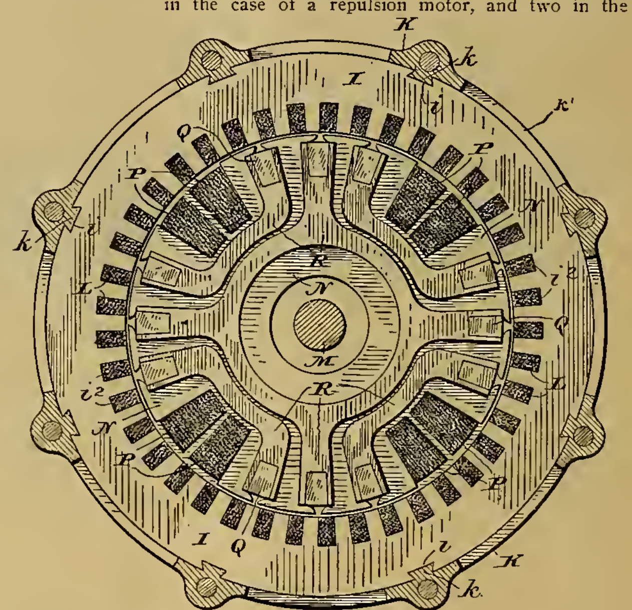


Fig. 2. Cross Section

INTERNAL-FIELD SINGLE-PHASE SERIES MOTOR the armature through the brushes is closed through the resistance.

The advantages in a single-phase commutator motor arising from the placing of the field inside the armature are said by the inventor to be numerous and important. The field core can be made as small as desired, and can have as small a core as may be wished. The depth of the slots in the armature may be increased indefinitely, without cutting off the armature teeth (since the slots extend farther away from each other the deeper they are formed), and thus the armature ampere turns can be increased indefinitely. The amount of field cop-

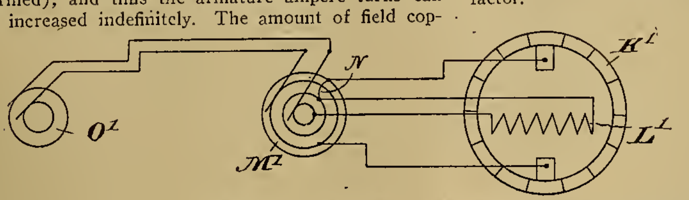


Fig. 3. Connections as a Series Motor

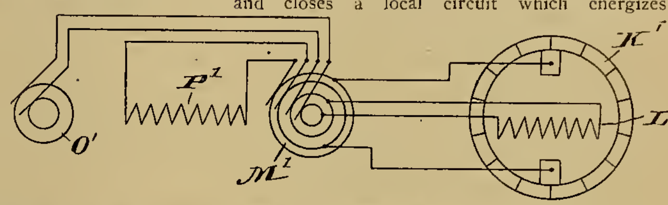


Fig. 4. Connections as a Repulsion Motor

INTERNAL-FIELD SINGLE-PHASE SERIES MOTOR

per is very much less in this motor than in an alternating-current motor in which the field is external to the armature. For a certain size and weight of motor, the power or rating of the motor is very largely increased. For the same peripheral speed, the revolutions per minute are decreased by the use of the internal field, in spite of the fact that the output is greater. This means a slower speed motor and, therefore, a smaller gear ratio and greater gear efficiency.

Because of the greater amount of space available for armature slots, the armature ampere turns may be largely increased for the same size and weight of motor, by making the armature external. The tangential magnetic drag on the rotor is thus increased in the same ratio (the field flux being the same in each case), and the torque is greater both on this account and on account of the greater diameter of the rotor which is permitted. Because of the increase in armature ampere turns made possible by the new arrangement, the counter-electromotive force of the armature becomes comparatively greater, and hence a better power factor is obtained at all loads. On account of the increase in armature ampere turns, the inductive voltage component of the armature is made greater, while that of the field may be correspondingly decreased, without altering the power of the motor, but, since the armature inductance may be compensated, this means a better power factor for the motor.

By making the field internal, the leakage of field flux is less, and hence a lower inductive component of the field voltage results, and a better power factor is obtained. This is due, first, to the fact that, with the internal field, diverging poles are obtained, whereas, with the external field, converging poles are obtained; and, second, to the fact that the flux density in the air gap is a great

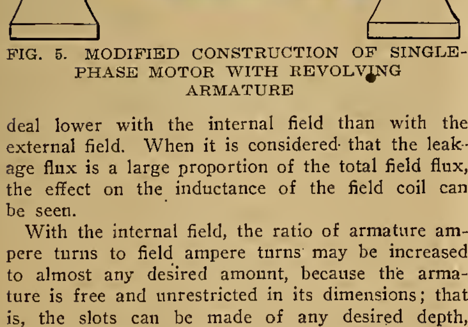


FIG. 5. MODIFIED CONSTRUCTION OF SINGLE-PHASE MOTOR WITH REVOLVING ARMATURE

deal lower with the internal field than with the external field. When it is considered that the leakage flux is a large proportion of the total field flux, the effect on the inductance of the field coil can be seen.

With the internal field, the ratio of armature ampere turns to field ampere turns may be increased to almost any desired amount, because the armature is free and unrestricted in its dimensions; that is, the slots can be made of any desired depth, without thinning the teeth, the teeth, in fact, growing thicker with the greater depth of slot.

With the internal field there is greater ease in getting the necessary area for slots for compensating winding, because the field poles can have a greater peripheral width for the same size and weight of motor. The compensating turns can also be a great deal shorter with the internal field than with the external field, and hence, for the same amount of copper a better compensation is obtained with the internal field. This is true, first, because the turns may be given greater sectional area (being shorter) for the same amount of copper; and, second, because their resistance is less on account of their shorter length, and hence the flux necessary to induce the compensating currents is greatly reduced, which means better compensation and better power factor.

In this motor there is very much more room than usual for resistance leads and choking devices of any sort that may be used to make possible satisfactory commutation. This room is in the space outside the commutator. Here, too, the resistance leads have better radiating facilities and are much more accessible for repair. This armature construction makes possible the removal of the commutator from the motor proper, with the attendant advantage of increased available space.

With the internal field, the field core, which is the seat of constant iron loss, is greatly reduced in volume, without increasing the flux density in the same. In spite of the higher power obtained with the internal field, the iron loss is reduced below that of the external-field type.

The armature iron, which is the seat of the variable iron loss, is increased in volume in the case of the internal field, but the average total iron loss for different speeds is not greater with the internal field than with the external field. The armature, being external, is best suited for radiating heat.

Modifications of the construction above described can readily be made without departing from the principles of the new motor. For instance, the armature may rotate while the field is held stationary, the armature being external to the field, as before described. This form is illustrated in Fig. 5. The motor is mounted on a stationary shaft *H'*. This shaft has fixed to it the internal stationary field, *I'*. The external rotating armature *K'* turns on the shaft and is provided with a gear wheel *L'*, by which power can be taken from the motor. Current is supplied from the alternator M' to brushes *N'* and *O'*, the latter contacting with slip rings *P'* and *Q'*. These slip rings are connected with brushes *R'* and *S'*, respectively, which rotate with the field, and the brushes complete the circuit with the armature through slip rings *T'* and *U'* on the armature.

SIX-CENT FARE QUESTION

The Massachusetts Railroad Commission has upheld an advance in fares to six cents on another street-railway system, thereby strengthening the position of all the railways in that state, many of which will be encouraged to raise fares. The commission also upheld the principle of an extra charge of one cent for the issuing of a transfer check on the Newton system, and this is likely to be followed by similar action on other lines.

The commission believes that railways should not be compelled to run at a loss, and its decisions have been based upon the actual financial showing made by the roads concerned.

It is a fact that of the 62 roads reporting to the state for the last fiscal year, 20 failed to earn operating expenses, 20 others could not pay dividends, and only 16 were able to pay four per cent. or more.

AN EARTHQUAKE CIRCUIT-BREAKER

Two Californians have devised a piece of apparatus to be knoyn as an "earthquake-disturbance-operated circuit-breaker." Some damage has been reported in certain localities by the disarrangement of electric wires due to the earthquake shock. In order to provide against this possible fire hazard the present invention disconnects the current at the first intimation of anything like a seismic tremor. George David Haas and Edwin G. Derbridge are the inventors of the circuit-breaker. Both are San Joseans of long residence, says the San Jose Herald, which announces the invention. Mr. Derbridge is with the Garden City Electrical Works.

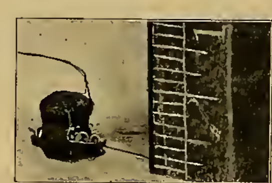
The device works on the simple principle of a pendulum. In fact, it is an electrical seismograph, a heavily weighted electrode swinging normally between stationary contacts. When the pendulum is caused to swing by any earthquake disturbance, it makes contact with one of the surrounding points, and closes a local circuit which energizes a solenoid to switch off the current in the power wires.

A TINY ELECTRIC MOTOR

The miniature electric motor, which is illustrated herewith, is the result of the painstaking effort and electrical talent of a Chicago boy, J. Elliott Jenkins. Young Jenkins is 16 years old and, as this sample of his work shows, is possessed of considerable mechanical and electrical ingenuity.

The tiny motor is so small that it might be enclosed in a space less than one-thirtieth of a cubic inch in volume. Its over-all dimensions are somewhat as follows: Length between bearings, 7-16 inch; height of field frame, 11-32 inch; greatest width, 7-32 inch. The shaft, which extends considerably out of the rear bearing, is made of a small needle.

The field frame is made of ferrotype metal and



A TINY ELECTRIC MOTOR

was cut and bent from a single piece. The field and armature are wound with No. 38 enamel-covered copper wire. The manufacturer of this motor designed it to propel a small boat and to be operated by one to three Grenet plunge cells, which he was able to make very small though deriving a comparatively large current.

Young Jenkins is a son of Mr. John E. Jenkins of 1730 Prairie Avenue, and the young man is given every opportunity for the prosecution of his electrical studies. He expects to adopt electrical engineering as his profession.

FRANCE WANTS MOTORS

Since electric power is supplied at very low rates for industrial purposes, the United States consul at Marseilles reports, and current is distributed throughout the city and is becoming generally available throughout the south of France, the present demand is for electric motors of every type, though particularly small ones. The duties on American motors are very high, but if American manufacturers can overcome these discriminatory tariff charges, the consul writes, they will find in this region an excellent market for electrical machinery, and one which tends to increase from month to month. "No apparent effort is being made, however, to dispose of American devices; no traveling representatives of our great companies are seen here; and only desultory efforts to build up trade by means of correspondence are heard of. The reputation of the United States, under the head of electric machinery, has been created and maintained in France chiefly by French branches of American concerns, who manufacture and sell their wares in this country, employing American ideas without any corresponding benefit to American labor."

A few addresses of French dealers in electric motors are listed with the Bureau of Manufactures at Washington.

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

WHEN the work of the United States Reclamation Service was organized, about three years ago, the Western Electrician called attention to the possibilities of hydro-electric power development in connection with these great irrigation projects. It is a pleasure, therefore, to give in this issue an illustrated account of the power development incidental to the great Salt River project in Arizona. At Roosevelt Dam—said to be the highest dam in the world—there is nearing completion a power house which will contain, ultimately, waterwheels and generators capable of producing electric power to the extent of about 4,000 kilowatts. This power will be used to operate electrically driven pumps needed in the irrigating system, and the current will be transmitted to a distance of 60 miles. Thus the advantages of electric power transmission will be coupled with the irrigation project pure and simple in a highly satisfactory manner.

GERMANY possesses an astonishingly large number of small waterpower plants. In Prussia alone there were in operation in the year 1898 no less than 19,567 waterpower installations, with a total capacity of 219,500 horsepower, or an average of 11.2 horsepower to each plant. Waterpower in Germany is mostly applied to the generation of electricity for lighting and industrial purposes. It is also used for pumping water into reservoirs for supplying cities with water and for irrigation and for drainage. State rights are carefully respected in the Fatherland in the matter of riparian laws. At the formation of the German Empire the right of eminent domain over the public water was reserved exclusively to the sovereign states joining the empire and now composing it. With few exceptions the German states do not develop the waterpowers themselves, but of recent years the question of public ownership of waterpowers has been seriously considered.

AS WAS EXPECTED, the returns for the fiscal year ended June 30, 1908, show that the electrical exports of the United States were less for that year than for the year ended June 30, 1907. The decrease was from $17,268,406 to $15,249,436, or nearly 12 per cent., and was undoubtedly the result of financial depression at home and abroad. However, the total for 1908 is larger than for any other year except 1907, and this is encouraging. The greatest decrease is shown in exports to the United Kingdom and the British colonies, while there is an excellent increase in the value of American electrical goods sold to Brazil, and substantial gains in the returns from Japan and Argentina.

It would be a fine thing if the electrical export trade of the United States could go on mounting upward indefinitely as it did so uniformly for ten years until the fiscal year just closed. But constant fair winds are not to be expected, and as this is the first setback, American electrical exporters will view the figures philosophically—with a determination, however, to have a different story to tell a year from now.

TELEGRAPH STATISTICS recently made public by the German government, transmitted to this country by an American consul and published here by a number of American journals, are inaccurate and do an injustice to the United States. It is stated that in the year 1906 the United Kingdom led the world in the number of messages sent. This number is placed at 94,000,000, while the United States is said to be second with 65,500,000. The latter statement is incorrect. The Western Union Telegraph Company alone in 1906 sent 71,487,082 messages, not including messages sent over leased wires or under railroad contracts. The number of messages handled by the Postal Telegraph-cable Company in the same year is not publicly known, but even if the figure did not exceed 25,000,000 messages the total for the country would exceed that of Great Britain.

In other respects the German statistics are wide of the mark. For instance, the "average cost per message" in the United States for the year named is placed at 42 cents. The official Western Union report gives the "average tolls per message" as 31.6 cents and the "average cost to company of message" as 27.6 cents. Again, the "total receipts" and "miles of line" are both smaller, as given for the whole country, than the figures given for one company alone.

FROM A SOUTHERN city comes a report, through the underwriters' electrical inspectors, of a situation which is characteristic and has a touch of human interest.

"The local lighting company is not in a very flourishing condition, and the prospect for an underground system in the near future is not encouraging. The lighting company will support an up-to-date standard for inside wiring in all new work, but desires that improvements deemed necessary in old work shall be secured if possible without decreasing its income. The city has been remarkably free from fires of electrical origin."

Not very flourishing; dreading a mandate to put its wires underground owing to the expense; really desirous of encouraging first-class electrical construction, but fearful of alienating customers, and so decreasing its not-too-large income; practically no serious electrical fires to cause alarm—the picture is one that many central-station companies in medium-sized cities throughout the country will recognize without difficulty. It represents a situation that confronts many electric-light companies established fifteen or twenty years ago.

The remedy, undoubtedly, is an awakening in all departments to modern methods of doing and getting business. Perhaps an outside new-business hustler could be imported to advantage. Probably more power business is to be had if a determined effort be made to get it. No doubt more electric signs could be installed, and possibly the company doesn't realize the advantages of an attractive showroom for displaying all sorts of electrical appliances. Then, too, perhaps the advantages of modern high-efficiency electric lamps in replacing gas and of such useful helps as porch lights and the electric flatiron are not fully realized. In short, an eager, active fighting spirit is needed—"hard! hard!" as the football coaches say. And right now is the time to begin preparations for the fall campaign.

"DAYLIGHT SAVING" by an arbitrary change in the clocks of the country at spring and fall, as seriously proposed by a bill now pending in the British Parliament, must be regarded with scant approval by the purveyors of artificial illumination in the United Kingdom. A select committee of the House of Commons thinks that conspicuous benefits would be secured by the simple device of turning clocks and watches forward one hour at two o'clock in the morning, Greenwich mean time for Great Britain and Dublin mean time for Ireland, on the third Sunday in April, and turning them back one hour at two o'clock in the morning of the third Sunday of September.

Six desirable results, the committee believes, would flow from the bill if passed into law: (1) Work and leisure would be moved an hour nearer to sunrise. (2) More daylight would be used for recreative purposes of all kinds. (3) Saloons would be less frequented. (4) There would be more time for the training of the territorial forces. (5) The physique, general health and welfare of all classes of the community would be benefited. (6) There would be a great reduction of expenditure for industrial, commercial and domestic artificial light.

It is the last clause that undoubtedly excites the apprehension of the electric-light companies. Competition with gas is more keen in Great Britain than in the United States, and if in addition everybody goes to sleep with the chickens, being already sated by an extra hour of daylight enjoyment, the lot of the British central-station manager will be indeed deplorable. It could be made still worse by positively forbidding all evening meetings and theatrical performances and passing a curfew law. Let every person be compelled to retire at 9 p. m. under pain of being thrown into an unlighted dungeon.

It is not strange that there is opposition to the bill, which, to tell the truth, seems rather absurd at this distance. The habits of the people, while greatly affected, are by no means governed by the rising and setting of the sun. It is not likely that the bill will become a law, for in any event it would be non-compulsory and would only lead to confusion worse confounded.

ELECTRICAL EXPORTS FOR 1907-1908

During the fiscal year ended June 30, 1908, the United States exported a total value of $15,249,436 in electrical machinery and apparatus. Compared with the exports for 1907, which were $17,268,406, this decrease of nearly 12 per cent. shows that the recent financial condition had its reflection in the quantity of foreign purchases going out of this country. In fact, the total business was little greater than the $14,800,237 recorded for the same period ended in 1906. Previous to the present year the annual totals had shown an average increase of about $2,500,000 each year, indicating a healthy growth in the supply of American electrical machinery to foreign users.

Comparing the extent of the purchases of various countries for 1908 with their requirements for 1907, it is instructive to note that the decrease mentioned above is particularly noticeable in the case of the United Kingdom and the British colonies, which, taken together, form by far the best customer of the United States for electrical manufactures. Canada alone shows a falling off of $1,100,000, or over half of the total decrease. This is partly accounted for by the number of American concerns with Canadian factories. France and all other European countries show losses, and so do Mexico and some South American countries. On the other hand, Cuba, Argentina, Brazil and Japan are represented by substantial gains.

The term electrical appliances used in the table includes telegraph and telephone instruments. The following table gives the electrical exports for the fiscal years ended June 30, 1907 and 1908 to the principal countries.

Exported to—	1908 Electrical Appliances	1908 Electrical Machinery	1908 Total	1907 Total
United Kingdom	$ 706,675	$ 779,625	$1,486,300	$2,719,780
Belgium	104,245	....	104,245	206,846
France	64,741	528,307	593,048	798,338
Germany	192,502	100,930	293,432	494,162
Other Europe	127,682	446,782	574,464	756,810
British North America	1,336,329	862,024	2,198,353	3,337,080
Central America	233,683	128,283	361,966	297,424
Mexico	628,225	1,301,584	1,929,809	2,132,153
Cuba	401,540	230,614	632,154	561,549
West Indies	59.179	20,344	79,541	66,230
Argentina	229,233	254,107	483,340	391,688
Brazil	1,211,026	967,556	2,178,582	1,547,512
Other South America	534,705	159.848	694,643	823,825
Japan	444,797	1,496,093	1,940,890	1,633,985
British Australasia	162,516	370,837	533,353	646,870
Philippine Islands	112,839	161,467	274,306	261,397
Other Asia and Oceania	....	152,624	152,624	....
British Africa	43,529	124,572	168,101	186,014
Other Africa	....	53,115	53,115	....
Chinese Empire	....	38,235	38,235	60,950
British East Indies	....	308,868	308,868	278,867
Hongkong	....	9,404	9,404	18,442
Other Countries	160,663	....	160,663	230.899
Totals	$6,754.217	$8,495,219	$15,249,436	$17,268,406

The total electrical exports for the month of June, 1908, amounted in value to $1,081,229, which shows a slight gain over the total for the preceding month of May, $933,202, but lacks a great deal of equaling $1,835,236, the figure for June, 1907. Classified into appliances and machinery, the totals for June, 1908, were: Electrical appliances, $421,732. Electrical machinery, $659,497. The principal countries exported to in June, 1908, were:

Electrical appliances—British North America, $98,720; Brazil, $92,970; Mexico, $52,267; United Kingdom, $39,940; Central America, $24,850; Cuba, $20,036; Philippine Islands, $13,913; Belgium, $11,128; British Australasia, $11,120; Japan, $10,277; Germany, $4,873; France, $4,752; Argentina, $4,582; British Africa, $3,976.

Electrical machinery—Cuba, $149,364; Brazil, $99,997; France, $84,324; British North America, $66,600; Mexico, $62,538; Japan, $40,981; United Kingdom, $36,466; British Australasia, $13,835; British East Indies, $11,762; British Africa, $11,268; Central America, $10,293; Germany, $7,642; Philippine Islands, $6.030; Argentina, $5,000; Chinese Empire, $3,182.

HYDRO-ELECTRIC POWER FOR MILWAUKEE

Contracts for 8,000 horsepower from the Wisconsin River at Kilbourne have been closed with the Southern Wisconsin Power Company by the Milwaukee Electric Railway and Light Company. The power company proposes to transmit electricity 150 miles from the new dam at Kilbourne, which would bring Milwaukee within the zone of its operations. The power from Kilbourne will be used to operate the interurban lines and relieve the two Milwaukee power plants.

Phillip L. Spooner of Madison, brother of former Senator John C. Spooner, is president of the power company, which was incorporated in 1906 with a capital of $1,500,000. Power will also be sold in Madison.

CENTRAL-STATION CHANGE IN ST. LOUIS

Mr. Arthur Williams, until recently well known as general inspector of the New York Edison Company, has been elected general manager of the Union Electric Light and Power Company of St. Louis. He succeeds in this position Mr. V. W. N. Powelson, who will open an electrical and hydraulic engineering office in New York city.

The new general manager of the Union company is one of the most widely known men in the central-station field. Born in 1868, Mr. Williams is still a young man, but he is one of the pioneers in the electrical business, having entered the employment of Rennie & Smith, electrical contractors, in New York city, in September, 1884. Shortly afterward he went with the New York Edison Illuminating Company and performed varied and general duties from repairing to reading meters for the famous old Pearl Street station.

ARTHUR WILLIAMS,
General Manager Union Electric Light and Power Company, St. Louis

When he became general inspector of the New York Edison Company in 1890, Mr. Williams showed his ability in building up the organization of the new department and in selecting the best men for its purposes. Both in America and abroad Mr. Williams' central-station knowledge is regarded as authoritative and he has acceded to invitations to contribute a number of papers on the general subject to the proceedings of leading electrical societies. Several of these which have come be to regarded as classical among central-station literature are: "The Relations of the Electrical Supply Companies to Their Customers," "Isolated Electric-light Plants" and "Electric Elevators."

In 1901 Mr. Williams served the New York Electrical Society as president and in 1906 was given the same office in the National Electric Light Association. He is a member of the American Institute of Electrical Engineers, the New York Electrical Society, the National Arts Club, the Municipal Art Society and the Union League Club of New York.

Among electrical men Mr. Williams is noted for his tireless industry, his unfailing tact and his broad, comprehensive view of large problems. He has made an especial study of the relation of the central station to the public and is an authority on such subjects as municipal ownership, municipal regulation and public-service commissions. He will be a decided acquisition to the electrical men of the West and will be warmly welcomed.

HAS EDISON AN AIRSHIP?

Newspaper reports are to the effect that Thomas A. Edison in a recent conversation with Henry Farnam, who is on a visit to America, showed the French aeroplanist plans for a flying machine which he believes will rise from the ground and navigate the air. The French inventor was reported to be delighted with the sketches and plans and spent a day at the Orange laboratory discussing aeronautics with Mr. Edison.

"BREAKDOWN SERVICE" IN NEW YORK

The Public Service Commission for the First District of New York has finally secured from the New York Edison Company the grant of "breakdown service" or the supply of power to isolated plants in cases of emergency. When the Legislature fixed the maximum rate for electricity in New York (Manhattan) at 10 cents per kilowatt-hour breakdown service, formerly given, was discontinued. By the original terms, prior to 1905, such service was supplied to all applicants at rates varying from $10 per kilowatt of installation up to $30 per kilowatt of maximum demand.

The Edison company proposed to furnish breakdown service at $30 per kilowatt of installation of power-using devices. This met with the objection that, besides being prohibitive, it was unfair, as hardly 30 to 60 per cent. of the total installation of a building is in use at one time. Accordingly a charge computed from total installation and not maximum demand would be unjust.

The company maintained that its experience had shown that the rate was fair, and though neither side was armed with data to confirm its contention, the following tentative proposal was made on a guarantee of $30 per kilowatt per year of maximum demand:

(1) Breakdown service will be furnished to any owner of a private plant who applies for it.

(2) The use of current need not be restricted to certain hours or certain purposes; it may be taken at any time and for any purpose, thereby obtaining not only pure breakdown service, but auxiliary service as well.

(3) The consumer may specify the maximum amount of current to be taken at any one moment regardless of his installation.

(4) The guarantee will be computed, not upon installation, but upon maximum demand.

(5) The company will place recording devices on every breakdown connection and take the records under the supervision of the commission for the purpose of determining a fair charge for service to be fixed in the future.

Commissioner Milo R. Maltbie has gone to some length in a report submitted to oppose the claim that it is not fair, even if practically possible, to ask the supply companies to furnish current to private plants, their competitors, when it becomes disadvantageous for these competitors to supply it themselves, any more than it would be fair to permit one express company to take the more profitable business and to compel a competitor to do that portion of its business which was conducted at a loss.

This analogy Mr. Maltbie considers unfair. He declares that it would be equally unreasonable on the part of a railroad company if it refused to carry a passenger who prefers to use his automobile or walk during fair weather or when he wishes to go only a short distance. "Neither does it seem fair for an electric-supply company, which is also quasi-public, to refuse to supply an individual merely because he produces a portion of the current which he consumes. The electric companies have been given the use of public property; their wires are in the streets; they have many rights and privileges which the ordinary individual does not possess. It seems but fair, therefore, that they should also undertake to perform the obligations which go with these privileges, and one of these fundamental duties is to supply current to everyone who desires it and who pays a fair price.

"It should not be assumed that breakdown service or any special kind of service must of necessity be supplied at the same rate at which other service of a different character and of a different cost is supplied. It may be that such special service as we are now considering should be supplied at a different rate from that charged for current under ordinary circumstances; but, assuming that the rate is fair, that a reasonable profit is allowed to the company thereon, it is, in my opinion, the duty of the supply companies to provide breakdown service under ordinary circumstances."

The Long Island Railroad has set aside $2,000,000 for the electrification of its tracks from Long Island City to Port Washington, and from Flushing to Malba.

STREET-RAILWAY CONVENTION

As announced, the forthcoming convention of the American Street and Interurban Railway Association and its subsidiary associations will be held in Atlantic City from October 12th to 16th. There are now five of the auxiliary associations—children of the parent association. They have to do, respectively, with Accountants, Engineering, Claim Agents, Transportation and Traffic, and the Manufacturers. The last-named will have charge of the exhibition, which will be held on Young's Million Dollar Pier. This pier extends into the ocean 1,800 feet from Atlantic City's beach-front line. It has an average width of 98 feet. Over 60,000 square feet of net exhibit space is available. The Marlborough-Blenheim will in general be considered the headquarters hotel of the American association, and also of the Manufacturers' association. The Chalfonte Hotel will be the headquarters hotel for the Accountants' association, and the Engineers will have their headquarters at the Dennis. Both the Claim Agents' association and the Transportation and Traffic association will use the Traymore as headquarters.

Atlantic City is amply provided with hotels. The secretary of the American association (whose office is at 29 West Thirty-ninth Street, New York city), in his Convention Bulletin, No. 2, gives a schedule of rates. Reservations should be made directly with the hotels. The secretary also says that "the usual arrangements are being made with the various passenger traffic associations, whereby those attending the convention will be enabled to obtain round-trip tickets upon the certificate plan."

There will be two convention halls, located on the convention pier. All of the meetings of the American association, the engineering association and the Transportation and Traffic association will be held in the meeting halls on the convention pier. The Accountants will hold their two sessions on Wednesday at the Chalfont Hotel, and their Thursday and Friday sessions on the convention pier. The Claim Agents will hold all of their sessions at the Traymore Hotel.

The morning of Monday, October 12th, will be reserved for registration purposes, and the first meetings of the convention will be held on the afternoon of that day. The meetings of the various associations will continue throughout the week, closing on Friday, October 16th. Considerable attention has been given to the arrangement of the days upon which the various associations will meet. The following general schedule of meeting days has been decided upon:

MONDAY, OCTOBER 12TH.

9:30 a. m. to 12:30 p. m.— Registration and Badges. Claim Agents' Association. Transportation and Traffic Association.	2 p. m. to 5 p. m.— Meeting of Claim Agents' Association. Meeting of Transportation and Traffic Association.

TUESDAY, OCTOBER 13TH.

Morning session.— Registration and Badges. American Association. Engineering Association. Meeting of Claim Agents' Association. Meeting of Transportation and Traffic Association.	Afternoon session.— Registration and Badges, Accountants' Association. Meeting of American Association. Meeting of Engineering Association. Meeting of Claim Agents' Association.

WEDNESDAY, OCTOBER 14TH.

Morning session.— Meeting of Accountants' Association. Meeting of Engineering Association. Meeting of Claim Agents' Association. Meeting of Transportation and Traffic Association.	Afternoon session.— Meeting of American Association. Meeting of Engineering Association.

THURSDAY, OCTOBER 15TH.

Morning session.— Meeting of Accountants' Association. Meeting of Transportation and Traffic Association. Inspection of Exhibits by Engineering Association	Afternoon session.— Meeting of American Association. Inspection of Exhibits by Engineering Association.

FRIDAY, OCTOBER 16TH.

Morning session.— Meeting of Accountants' Association. Meeting of Engineering Association.	Afternoon session.— Meeting of Engineering Association.

In addition to the above programme, the Accountants' association will have a "get together" lunch and smoker on Wednesday afternoon, the Claim Agents will have a smoker on Tuesday evening, and the Transportation and Traffic association will have a dinner on Wednesday evening. Similar arrangements will probably be made for the American and Engineering associations.

SEATTLE'S MUNICIPAL HYDRO-ELECTRIC PLANT

Two units of 4,000 kilowatts each are being added to the Seattle (Wash.) municipal power plant on the Cedar River. A force of 150 men has been at work laying the 68-inch flume across the mountains. This pipe starts from the dam at the head works and continues for 16,000 feet, when it splits into two sections of 48-inch riveted steel pipe.

The power house, where the electric generating machinery is driven by the water collected from the head works, will be enlarged to admit the two new Westinghouse generators. In order to make this extension it was necessary to remove 3,500 cubic yards of material, 85 per cent. of which was solid rock. Two turbines, of 8,000-horsepower capacity each, will drive the generators which generate 2,300 volts. The power lines will carry voltage of 60,000 and the present transmission line is being duplicated to handle the current. At the Seattle end of the wires the current will be stepped down by eight transformers, each having 1,500 kilowatts capacity. There will be substations to handle the power at West Seattle, Fremont, Ballard and Columbia. These will be connected with the main sub-station by lines carrying 15,000 volts.

The generating station apparatus has been made in duplicate to insure continuity of service. The enlarged plant output will be close to 20,000 horsepower.

The work on the municipal light and power plant has been carried on by the municipality. Foremen hired by the city have overseen the work of city-employed workmen.

MICHIGAN STATE CONVENTION

The annual convention of the Michigan Electric Association will be held at the Pantlind Hotel, Grand Rapids, on August 18th to 21st, inclusive. A large attendance is expected. Mr. H. W. Hillman, general manager of the Grand Rapids-Muskegon Power Company, is president of the association. An interesting programme has been arranged. The entertainment features are in charge of a committee of which Mr. A. L. Searles, manager of the Grand Rapids office of the Fort Wayne Electric Works, is chairman. On Tuesday afternoon, August 18th, an automobile ride has been planned for the ladies, and special cars have been secured in which to give the gentlemen a trolley ride about the city and the nearby resorts. In the evening special cars will carry the guests to Ramona, where they will witness the vaudeville show. On Wednesday morning the ladies will shop and the men will hold a meeting. In the afternoon the ladies will go to the Airdome and the men will inspect motor installations and high-tension lines about the city. In the evening there will be a lecture by Dr. C. P. Steinmetz on "Lightning Phenomena."

A "rest-up" card party has been arranged for the visitors on Thursday morning. In the afternoon the entire delegation will move to Spring Lake by special cars on the Muskegon interurban, with dinner at the hotel and launch rides in the evening.

CONGRESS OF INVENTORS.

At the third annual meeting of the International Congress of Inventors, held at Rochester, N. Y., on August 4th, a number of matters of reform in existing patent laws and conditions were advocated. The Congress has planned work to secure the favorable action by the national legislature on bills which will be presented for the establishment of a standard for a United States patent, for the preservation of models, in the patent office, etc.

Joseph J. O'Brien, of Washington, who addressed the Congress, has for several years been at work upon an elaborate plan for the reconstruction of the patent office, and will soon publish a general statement on the subject.

C. C. Puffer, of Rochester, urged the advisability of action in relation to Great Britain's new patent law, arguing that it will work a great hardship upon Americans.

It is probable that in the future membership in the Congress will be restricted to inventors, instead of extending the privilege to manufacturers and patent attorneys.

Of the new officers chosen by the Congress, Walter S. Strowger of Rochester, N. Y., was elected president, and Ralph T. Olcott, Rochester, secretary-treasurer.

QUESTIONS AND ANSWERS

PERPETUAL MOTION IMPROVED

V. C. W., Anderson, Ind.: I have recently heard of an interesting new scheme. The promoters say that they have a water motor that is operated by water falling on it from a high tower. This motor runs a pump which forces the water up the tower again, a vacuum being created at the top of the pipe to aid in this operation, which goes on continuously as the water is used over and over again. The motor at the base of the tower can be used to drive other machinery. According to the promoters of the company, this system will revolutionize power production and will put steam engines out of business. Does the scheme seem plausible?

ANSWER

This scheme is a decided improvement on the Keeley motor; it is better than perpetual motion itself. The inventors propose, apparently, not only to keep a quantity of water circulating without friction, but to create a vacuum and supply external power besides! Unfortunately for this scheme there are certain inflexible laws of nature that stand in the way of its fulfillment. One of these is that we cannot create energy but can only use it or change its form, and in doing so we unavoidably waste a little in friction and heat or other form of energy that is of no service to us at the moment. For this reason the energy efficiency of all machines is always less than 100 per cent.

Perpetual-motion schemes seem to be perpetual in one way; they are continually cropping up. The reader who is interested may find a graphic account of several of them in John Phin's "Seven Follies of Science."

CROSS-TALK ON TELEPHONE SYSTEM

W. E. A., Mescalero, N. M.: I have just installed a metallic telephone circuit 20 miles long. On one end of the line a grounded system is carried on our poles for one mile on the second inside pin, which is 10 inches from our wires. At times we can distinctly hear talking from the grounded system to our metallic line. We have no ground wires. Kindly explain this trouble and how to overcome it. Our line is transposed every half mile. Is this sufficient?

ANSWER

The trouble is evidently caused by induction or "cross-talk" from the grounded line to the metallic one where the lines are carried on the same poles. The simplest way to overcome it is probably by transposing the metallic line more frequently in that stretch where the grounded line runs parallel with it. Have the grounded line run through straight, and transpose the two sides of the metallic line with each other so as to have, say, half-a-dozen transposed sections of uniform length in the troublesome mile. Thus, each side of the metallic circuit will be exposed equally to the inducing effect of the grounded line.

CHANGES IN FAN MOTORS FOR OPERATING AT HIGHER FREQUENCY

E. A. C., El Reno, Okla.: We have some 25-cycle, single-phase, commutating fan motors. How can we change them so that they will run on a 60-cycle circuit?

ANSWER

When applying a higher frequency alternating current to any apparatus than that for which it is designed the impedance of its circuit is increased. Consequently, if the same voltage is used, the current will be diminished. In the particular motors in question, the decrease in current would decrease the speed more than it was increased on account of the higher frequency. It will be necessary, therefore, to reduce the impedance by removing some of the turns on each of the coils. The sparking of a series alternating-current motor on 60 cycles will probably be so vicious as to prevent its satisfactory operation even when rewound.

"Rags," the mascot dog of the Illinois Traction Company, which is continually traveling upon the road, has been the subject of several newspaper stories lately, until now the papers along the road record his coming and going as they do the other officials of the line.

RECENT AMERICAN WORK IN POWER TRANSMISSION[1]

By Dr. Louis Bell

Much of the power-transmission work of the last five years or so has been of an unobtrusive character, mere extension without material change of what had gone before. In many instances, indeed, there was no need of innovation since the common voltages and types of apparatus proved perfectly adequate. As time has gone on, however, the tendency has been to use higher and higher voltages. The prevailing high prices of copper have served to stimulate this tendency of late, so that the use of moderate voltage, say 10,000 to 14,000, derived directly from the generators, has declined, and even for relatively short lines the voltage is frequently raised by transformers to 20,000 or more, the generators themselves being commonly wound for 2,000 to 2,500 volts.

In fact, the use of generators for more than this moderate figure is now rare in the ordinary hydro-electric transmission plants, and is chiefly confined to steam plants serving large lighting or electric railway systems in which the use of underground cables acts as a limitation on the practicable voltage.

On the other hand, the voltage of transmission in ordinary practice has been steadily rising, not by sensational leaps, but by steady progress, until at the present time one can scarcely classify anything short of 30,000 volts as of really high voltage, and double this figure is reached in something like a score of cases. In two notable plants, the Grand Rapids-Muskegon system in Michigan, and the Kern River line of the Los Angeles (Cal.) Edison Company, the working pressure is now approximately 75,000 volts, and the security of the service is sensibly as great as in the plants working at 50,000 to 60,000 volts. It is probable that within a year this limit may be raised to 100,000 volts or more, since at least two plants now under construction are being equipped for such working. Nearly all high-voltage transformers are equipped with one or more taps on the high-voltage side, so that they can be worked at 5 to 10 per cent. below their full voltage, and in many cases plants start up with the raising transformers connected in mesh and afterward gain assurance and pass to star connection and full voltage. The use of composite three-phase transformers is rapidly increasing as experience has been gained in transformer insulation, and this is the common type in high-voltage work on any considerable scale. There is no serious difficulty in providing transformers for 100,000 to 150,000 volts, or even higher pressures, and the possible advance in voltage depends directly upon line insulation.

Heretofore the factor of safety in the insulators has been rather unsatisfactory. It is easy to get porcelain of good quality but difficult so to design the structure as to gain security against surface leakage. When an insulator is dry and clean its power of holding up against extreme electrical strains depends chiefly on its external dimensions —i. e., on the distance which must be jumped by a discharge from the wire over the edges of the petticoats to the pin. In wet weather, and particularly in a driving drizzle, its power of resistance depends almost entirely on its ability to preserve enough dry surface in the interior to check surface leakage, since a wet surface is a conducting surface. In dry weather a big insulator with flaring petticoats may prove entirely dependable and yet fail entirely under a searching rain. Insulators with deep and narrow crannies between the petticoats are better under a wet test, although they may give trouble when dust storms are frequent. Of the two 75,000-volt American plants one (in the dry California climate) is on large pin-type insulators, with moderately flaring petticoats, while the other is chiefly on the later type of suspension insulator.

In this type several porcelain bells, either plain or with concentric petticoats, are strung together like a series of Japanese gongs, the uppermost being carried by the cross-arm, the lowest supporting the wire. The bells themselves are all of the same size, ranging from 10 inches to 15 inches in diameter, and are fastened together by metallic links variously held in position. In the simplest form the bells are channeled as in some strain insulators, and the linking wires loop through each other from above and below, holding the porcelain in compression between them.

Insulators of this sort are used with two to five or more bells in series, and are undoubtedly capable of enduring high voltages far better than any pin-type insulator yet designed. It is very difficult to find any pin-type insulator that will stand 100,000 volts in a driving spray for even a few moments, and even the best of them generally will flash over at 80,000 to 90,000, while even so few as three bells in suspension will hold 100,000 volts during a long "wet test." The two projected lines mentioned are being equipped with the suspension insulator, which appears to be the chief recent improvement in high-tension transmission.

Late constructions have been developed in the direction of reducing the number of supports by lengthening the spans. Moderately long spans on both steel and wooden poles have, of course, been used, but the Guanajato transmission line in Mexico initiated the plan which has since been extensively followed. This line was carried in spans of 500 to 600 feet, on steel windmill towers, and while great trouble was experienced at first with the insulation, improved forms of insulator have made the plan thoroughly practicable. Most recent American lines have followed it and with fair success, although there has been a tendency to use too light and unscientifically designed towers which have occasionally failed and are of dubious life. For economy two complete circuits have often been run on the same towers, a precarious practice, as is evidenced by the fact that most such lines have simultaneously lost both circuits in case of any really serious difficulty.

The American tendency to use so-called "standard" stuff for cheapness has until recently prevented scientific design of pole lines as mechanical structures, but there are now signs of improvement in practice which will eventually promote economy of material.

As a whole, the American high-voltage long-distance transmission lines perform very well, but there are unquestionably more brief suspensions of service than most operating companies would care to admit. Foreign bodies falling upon or blown upon the circuits and lightning are the chief sources of trouble. Recent circuits are spaced widely, generally on the basis of about a foot for each 10,000 volts in the higher voltages, and hence escape many accidents of the former class, but lightning remains the thing most to be feared. Many circuits, especially those on steel towers, are equipped with a grounded wire strung above the circuit wires, which is supposed to deflect lightning discharges to earth. On some lines it seems to have been very effective, on others of small value. Probably a direct stroke of lightning upon the line would do damage in spite of it, while induced discharges would often be successfully averted.

An electrolytic lightning arrester composed of aluminum dry cells of large surface, stacked in series, has been recently introduced, and very fervent claims are made for it. Theoretically it promises well, but it has been nowhere long enough in use to enable one to speak confidently of its merits. Some of the most important systems depend almost entirely on the horn type of arrester of large dimensions, but most use elaborate forms of multiple gap arresters shunted to earth from several points.

In power-house design little of novelty is presented. The generators and transformers are in larger units than formerly, and the controlling devices are more thoroughly worked out. In fact, American engineers are making rather a fetish of switchboard apparatus, so that its cost has become very burdensome, and its complication introduces not a little risk of trouble from the enormous amount of wiring involved.

The frequency of late has remained unchanged on a general basis of 60 cycles, even for the longest transmissions. The two notable exceptions are Niagara at 25 cycles and the great network of the Los Angeles Edison Company at 50 cycles. Both these date from the early days of transmission, and have simply adhered to the original frequencies. The longest transmission is still upon the system in Northern California, 232 miles from De Sabla to Sauselito, with the line from Niagara to Syracuse (N. Y.) a good second, at 165 miles, and several California lines not far behind. It is worth noting that there have been no material difficulties from the use of 60 cycles over the longest distances, and the long lines perform about as well as those much shorter.

The most interesting improvements in practice have been in the line of distribution. There is a strong tendency to unite a large group of hydro-electric plants into a single network whenever possible. Such great systems are to be found in Northern California, Southern California, Utah and Colorado, to say nothing of many less complete examples elsewhere. The gain in continuity of service from the use of a network is very important, since serious interruptions are very unlikely when each point can be fed from two or more directions. There is a great gain, too, in simplicity of the equipment, since each plant can be organized with the advantage of relying upon others. For example, a single waterpower can be utilized by one or two big generators and transformers depending on another power in case of breakdown, and yet not itself seriously affected by trouble in another plant on account of the cushioning effect of the long intervening circuits. It is quite certain that a group of moderate powers if intelligently developed can be brought into service more cheaply and can give more reliable service than a single plant of equivalent output organized in the usual manner and distributing power, like Niagara, chiefly along radii.

There is also the opportunity of utilizing in a single system hydraulic plants located on different watersheds and with different circumstances of high and low water so as to improve very greatly the conditions of hydraulic utilization. This situation has developed but slightly as yet, but it is highly promising.

In local distribution of power and light there have been some changes for the better. Most plants still depend mainly upon hand regulation, but of late some rather successful forms of automatic regulator for three-phase circuits have been brought out. The governing of the waterwheels, too, has been improved, and for the high heads the introduction of a successful type of needle valve has checked the waste incident to the use of deflecting nozzles for the impulse wheels. The palm for high head (920 meters) still rests with Switzerland, although the Rocky Mountain district furnishes some sensational falls.

In distribution work one interesting novelty has appeared in connection with a few transmission plants—the use of the so-called "magnetite" arc operated from mercury rectifiers. The arc itself gives an admirable light for out-of-door work, and the rectifiers, although of somewhat uncertain life, have been greatly improved and are fairly upon a commercial basis. In the main, American engineers still adhere to the alternating-current enclosed arc worked from constant-current transformers in spite of its poor efficiency as an illuminant.

Underground distribution is still unusual, and is in great measure confined to the old districts lighted by low-tension, direct-current mains. Now and then there has been a case of a high-voltage transmission taken underground from outlying districts to a sub-station, but the high-voltage cable problem is one that American engineers have never been called on seriously to face. High-voltage lines are run freely through well-settled country, and the risk has proved to be practically nil, since everybody knows that it is unsafe to meddle with the circuits, and the wires are so carefully erected that breaks are very rare and the grounded circuit is at once out of action. What few crosses of transmission lines with others have occurred have quite invariably been due to the shabby construction of the other circuits. With the steel construction now in vogue and insulators with ample factors of safety there is no material risk in using overhead transmission circuits of any voltage in almost any situation.

[1] From the London Times Engineering Supplement of June 3, 1908.

RESULTS OF CHICAGO TELEPHONE ORDINANCE

In a statement issued by President B. E. Sunny the earnings of the Chicago Telephone Company for six months ended June 31, 1908, are compared with the results of the same period in 1907. An increase of $7,935 in the gross earnings is recorded, while expenses decreased $325,652. However, $164,-572 more was spent on reconstruction during the 1908 period. The net result shows a decrease in the balance from operation of $108,976. In commenting on the comparison presented by the two years President Sunny calls attention to the fact that the new ordinance went into effect on December 1, 1907. For 1907 the operations of the company in the city and outside of the city were not recorded separately.

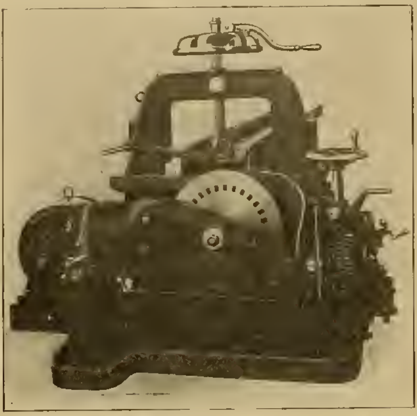
"A rough approximation of the effect of the new ordinance rates," writes President Sunny, "is that the receipts of the telephone company from 210,000 telephones (city and country) is the same as for 180,000 telephones at the old rate—a money difference of about $1,400,000 per annum. At the same time the average capital account is increased $3,-400,000 to pay in part for the 31,000 additional telephone stations."

ELECTRIC POWER IN FARMING

James M. Burke, of the University of California, has returned to Berkeley from a government investigation of the use of electricity in farm work throughout the state. Mr. Burke declares that the use of electric power has revolutionized farming in California, as farms are not only lighted by electricity, but cheap power pumps water for irrigation. The result has been to split up a large acreage in the San Joaquin and Sacramento valleys into small farms, mainly planted in fruit and alfalfa, and irrigated by electric pumping plants. Electric railways have done much to settle small farmers on these lands.

MOTOR-DRIVEN COLD-METAL SAW

The use of small cold saws for cutting off all sizes and shapes of metal work has become very general in a great variety of establishments, not only because of the utility of the saw itself, but also because of the fact that individual motors have been most successfully fitted to the saws. In the average machine shop one or more saws are required in the stockroom or some other equally inconvenient place for mechanical drive. Here the use of a small motor on the saw permits the loca-



MOTOR-DRIVEN COLD-METAL SAW

tion to be selected without reference to any requirements except the convenience of putting work through. In structural-iron works the self-contained unit of motor and saw can be picked up by a crane and carried to any part of the building or yard. Similarly, the use of the motor-driven set is found advantageous in a great many plants.

The cold saw, illustrated, which is one that does not require a bevel gear, is especially adapted to motor drive. It is manufactured by the Lea Equipment Company of New York city, and is fitted with a Westinghouse shunt motor. The size shown requires a 2½-horsepower motor and is capable of cutting eight-inch round stock. A Morse silent chain is used to connect the motor to the saw, in preference to gearing.

It is necessary to be able to adjust the speed of the saw in order to cut different metals with maximum efficiency. For instance, experience has shown that the peripheral speed of the saw should be 52 feet a minute with a coarse feed for structural iron, machinery steel and metals of this class. For annealed tool steel the lower speed of 37 feet a minute is the most efficient. This same speed is also used on Krupp's chrome nickel-steel. In order to obtain these speeds an adjustable-speed motor with speed range of 1⅓ to 1 is used, with a speed-controlling rheostat. It is only necessary to move the handle of the controller to obtain the desired speed.

FREIGHT HANDLING AT SCHENECTADY

In the case of the General Electric Company against the New York Central and Hudson River Railroad Company and others the Interstate Commerce Commission has decided that the complainant is not entitled to compensation from the railroad companies for doing switching and handling of freight cars within the precincts of its great manufacturing plant at Schenectady. It is held that "Carriers are under no duty to extend their transportation obligations with the extension of great industrial plants like that of the complainant. They cannot be called upon as part of their contract of transportation to make deliveries through a network of interior switching tracks constructed as plant facilities to meet the necessities of the industry. Their obligation as common carriers involves only a delivery and acceptance of carload shipments at some reasonably convenient point of interchange." The complaint was dismissed.

In the opinion of Commissioner Harlan accompanying the decision some interesting facts are given which show the magnitude of the Schenectady works. Following are extracts from the opinion:

The industry now bearing the name of the complainant was originally organized in New York city in 1881 as the Edison Machine Works. In 1886 it was moved to Schenectady, where 11 acres of land and two factory buildings were purchased from a defunct locomotive company. The business and property of the Edison Machine Works were then taken over by the Edison General Electric Company. In 1900 the present corporation, which in 1892 had taken over the enterprise, purchased a second steam switching locomotive. Later four electric motors were acquired and put in the service of switching cars to and from the storage tracks and in and around the plant.

In the meantime the complainant's business had rapidly expanded. It now owns 330 acres of land, of which 180 acres are inclosed within fences. Scattered about over this area are 140 buildings of varying size, including 50 or 60 shops, foundries and warehouses, in which 17,000 men are ordinarily employed. The buildings are located with more or less regularity, thus giving to the land within the inclosure something of the appearance of a factory town, with streets running through it. Immediately inside the present entrance gates are 4.7 acres of land, purchased in 1901 at a cost of $11,000 and now worth $18,000 an acre, upon which the complainant has constructed about three miles of storage tracks, capable of storing 500 cars without interfering at all with the operation of the extensive system of switch tracks running through the streets inside the inclosure, to the various shops, foundries and other buildings of the complainant. The storage tracks and the connecting switch tracks are of standard gauge; they aggregate 12 miles in length and occupy 23.1 acres of land. The cost of constructing them, over and above the cost of the land, was $136,696.60.

In addition to the standard-gauge switching tracks there are seven miles of narrow-gauge electric tracks, which cross and recross the standard-gauge system like a gridiron, and upon which 19 motors are kept in use in delivering raw material to the shops and in moving partially finished products from one shop to another. During 1906 there were 200,000 loaded cars so moved on these electric tracks and 35,000 such movements on the standard-gauge tracks. For such purely internal switching the complainant makes no claim. But in the same fiscal year the complainant delivered to the defendants 11,694 loaded cars and 13,497 empties, a total of 25,191 cars; it received 19,564 carloads and 5,589 empties, a total of 25,153. Ordinarily the complainant receives about 80 cars a day, mostly loaded, and sends out the same number, of which about one-half are loaded. In doing the switching between the storage tracks and the limited number of buildings at which carloads are usually loaded and unloaded, there are about 112,000 carload movements a year which are made by the complainant with its own crews and facilities, at a cost to it, estimated as we think with reasonable accuracy, of 53 cents per movement. It is for this expenditure that counsel contends that the defendants ought to reimburse the complainant.

THERMOSTATIC MAGNET PROTECTOR

In appreciation of the field which exists for a reliable protective device not dependent upon an electro-mechanical mechanism, the thermostatic magnet protector has been produced to protect electrical apparatus where there is danger of overheating. After a long series of tests under actual service conditions the form illustrated herewith was finally adopted by the manufacturer as embodying all the desirable features called for in a protective device of this nature.

The protector consists of a spring clip mounted on a metal holder and locked in position by means of a small metallic "button." This button is com-

THERMOSTATIC MAGNET PROTECTOR

posed of a special alloy, which will melt at a predetermined temperature, and in melting releases the spring clip, which may be made instantly to open or close the circuit, cutting the apparatus protected out of circuit, thus preventing a possible burn-out. It should be understood that this button carries no current and does not act as a fuse, but is dependent for its operation on the actual temperature of the apparatus to be protected.

The thermostatic magnet protector was primarily designed for the protection of arc-lamp coils. By placing the protector in series with and near the magnet coils, it is impossible to damage the windings, as the device will always cut the lamp out of service before a dangerous temperature has been reached.

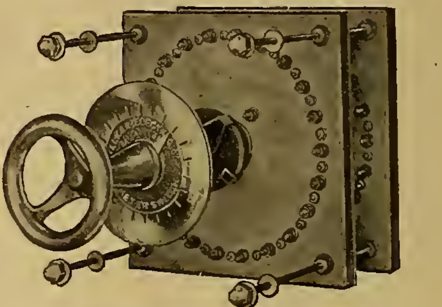
Arc-lamp repairs are expensive, and it is said that in one instance where these protectors have been installed a saving of approximately $3,000 has been effected within one year.

A report from the Commonwealth Edison Company's laboratory on a test made on June 8th of the arc lamps equipped with the thermostat protective device shows that the thermostat will not operate under ordinary operation of the lamp, but will blow within one or two minutes after the temperature of the surrounding air at the plug has reached 135 degrees C. The report also declared that on each test made, the thermostat opened the circuit satisfactorily.

The new device is being placed on the market by the Central Electric Company, Chicago, Ill.

AMMETER SWITCHES

For the use of a single direct-current ammeter in a number of circuits it is convenient to insert suitable shunts in the circuits and read the respective drops with the ammeter instrument. By

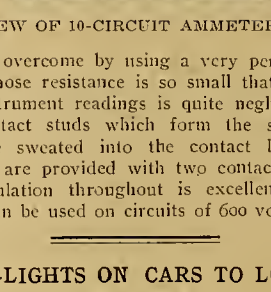


FRONT VIEW OF 22-CIRCUIT AMMETER SWITCH

means of the ammeter switches illustrated here the ammeter may be connected to any one of the shunts as desired.

An essential requirement of such an ammeter switch is that its resistance shall be practically zero, in order to avoid introducing an error into the instrument reading. Calibration of the ammeter with the switch does not overcome this difficulty, as the contact resistance is extremely variable.

In the switch manufactured by the Walker Electric Company, Philadelphia, the above objections



REAR VIEW OF 10-CIRCUIT AMMETER SWITCH

have been overcome by using a very perfect brush contact, whose resistance is so small that the effect on the instrument readings is quite negligible.

The contact studs which form the switch terminals are sweated into the contact blocks and rings, and are provided with two contact nuts.

The insulation throughout is excellent and the switches can be used on circuits of 600 volts or less.

DROP-LIGHTS ON CARS TO LOCATE TROUBLE

Interurban motormen on the lines of the Indiana Union Traction Company have been supplied with drop-lights which may be used in locating trouble under the cars. For this purpose alone they should form an important part of the equipment. In addition they may be used as a makeshift in case the headlight develops a malady that is beyond the skill of the motorman to remedy.

ALTERNATING-CURRENT ARC BETWEEN METALS

C. E. Guye and A. Bron have made a report for the Archive des Sciences (Science Abstracts, July 25, 1908) on "Stability and Potential Difference of the Alternating-current Arc Between Metals." It seems that very discordant results have been obtained by various experimenters. This is due to the complex nature of the phenomena and the great difficulty of obtaining stability, more particularly when the arc is long and the current small. The ratio of the period of burning to the period of extinction is of great importance. The potential difference varies largely with the stability of the arc. Every cause, like the pressure of the gas, currents of air, cooling, diminution of inductance and of the resistance of the circuit, etc., which tends to increase the period of extinction, raises the potential difference. By using an enormous reserve of pressure (20 kilovolts on open circuit) and by keeping the electrodes at temperatures very near their fusing points arcs of great stability were obtained. In these conditions the period of extinction became negligible and the explanation of the results obtained was simple and quite in accordance with the usual ideas of the mechanism of the arc.

It was found that when other things were the same the minimum potential difference tended to a constant value whatever the nature of the metals might be, provided that they were not easily volatilized. The following table is given:

Platinum	472 volts	Copper	479 volts
Gold	473 volts	Nickel	472-485 volts
Palladium	468 volts	Iron	477 volts
Silver	477 volts	Aluminium	455-500 volts

The experiments were carried out in air, at a pressure of 40 centimeters of mercury, the distance between the electrodes being four millimeters and the current 0.1 ampere at a frequency of 50 cycles. The nickel and aluminum arcs were the most unstable. The greatest divergences were obtained for copper. In air 502 volts was found. This was probably due to the layer of oxygen round the electrodes increasing the instability. In nitrogen the numbers found for copper and platinum were practically the same. Experimenting on metals which give off large quantities of vapor the potential difference was found to be much smaller. For cadmium it was from 340 to 360 volts, for zinc 285 to 295 volts, and for magnesium it was 242 volts. These experiments explain the divergences obtained by previous experimenters and are in excellent accord with the theory of the arc. It is necessary to bring the electrodes to incandescence so that they emit the electrons necessary to maintain the arc.

The medium ionized by the shock of these electrons is the most important factor in determining the potential difference. When the arcs are long and the current small, therefore, we should expect the potential difference to be the same whatever the metals, provided that the vapor they give off be not large in amount. The authors have also found that for very short arcs taking great currents the potential difference has a minimum potential for a certain pressure of the surrounding medium. Both in nitrogen and in air this minimum value is independent of the kind of metal used for the electrodes. The pressures giving the minimum potential differences were from five to seven centimeters of mercury. It appears, therefore, that when the rarefaction exceeds a certain amount the number of gaseous molecules between the electrodes is no longer sufficient to allow the necessary ionization, and so it is necessary to raise the potential difference in order to maintain the current. When the experiments are made on an arc in its most stable state the law connecting the fall of potential difference with the diminution of pressure is rigorously linear.

FLYWHEEL EXPLOSION IN NORTH ADAMS

The bursting of the flywheel, on a 500-horsepower compound Fitchburg engine, in the electrical department of the North Adams Gas Light Company at North Adams, Mass., last week, did damage to the amount of $10,000. The engineer had detected something wrong with the engine, and sprang to one of the shut-offs, but an instant later the flywheel had burst.

Various parts of the wheel, which was 15 feet in diameter, crashed about, denting brick walls, smashing windows and skylights into bits and tearing down wires. No person was injured. The engine was a total loss, and the building will require considerable repairing. The loss is covered by insurance.

TELEPHONIC CONVERSATION AS EVIDENCE

According to the Supreme Court of Minnesota, a telephonic conversation is admissible in evidence, when, from all the circumstances, the identity of the person answering the telephone is established with reasonable certainty; and the recognition of the voice or the admission of the one answering that he is the person desired is not necessarily required.

AN EXHAUST STEAM TURBINE PLANT

An excellent example of the utilization of exhaust steam from prime movers by exhaust-steam turbines, is that afforded by the Wisconsin Steel Company's mill at South Chicago. This installation, the first of its kind in America, is interesting from both the mechanical and electrical points of view and possesses many unique features of design.

The turbine, which is of the well-known Rateau type, manufactured by the Western Electric Company, utilizes the exhaust steam from the reversible engine used to operate the blooming mill, which is of the reversible type common to rolling-mill operation. This engine runs non-condensing, and under normal conditions develops a little over 1,000 horsepower. The steam, after passing through the receiver, where the shock of the puffs of steam is removed, enters the accumulator or "regenerator," and from there passes to the turbine and condenser.

The receiver tends to relieve the accumulator of the severe shock and strain which would result if the engine were allowed to exhaust directly into it. The receiver is provided with an exhaust valve, to be used when there is more steam than necessary to meet the demands of the accumulator and turbine. In such a case, the valve is opened to the atmosphere.

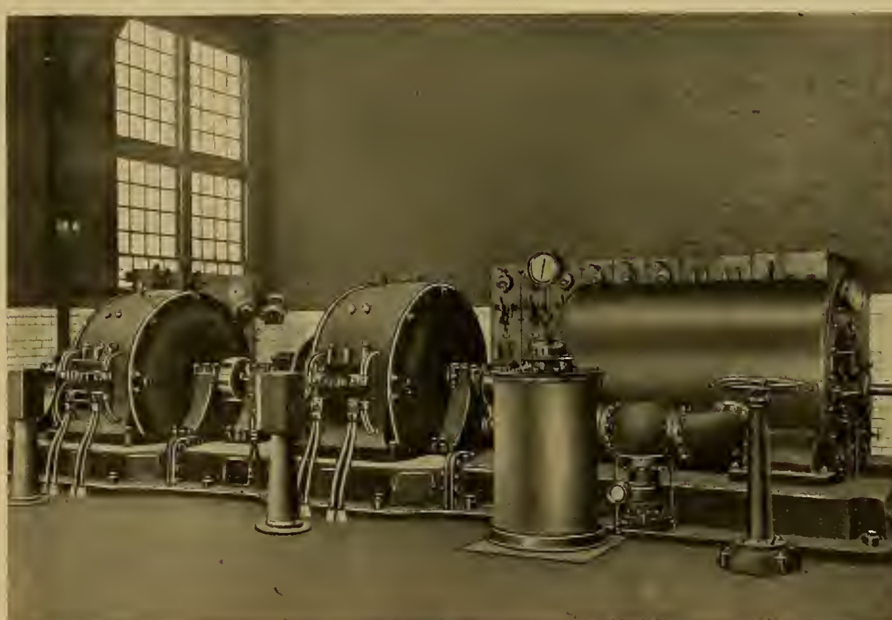
The accumulator or "regenerator" is perhaps as interesting as the turbine itself. It consists of a horizontal tank divided into two decks, each deck being fitted with a series of flues. This allows steam generated in the lower deck to pass up through these flues to the upper deck. This accumulator acts as a sort of a heat reservoir, absorbing or giving up energy as required by the turbine. The steam entering the accumulator at the bottom by means of a series of pipes, the ends of which are perforated, passes through the water in the accumulator. Part of this steam condenses, giving up heat to the water in the accumulator. As the accumulator operates at practically atmospheric pressure, there is, when the engine is running, a large mass of water in the accumulator at 212° Fahrenheit.

Now, in case the engine stops, the supply of exhaust steam is cut off. If the turbine is loaded, the steam, passing through it to the condenser, will tend to lower the pressure of the accumulator. As the water is at 212° Fahrenheit, a temperature slightly above that corresponding to a decrease in pressure, this water will give off steam and act as a boiler operating at atmospheric pressure. This evaporation will cool the water, so that when exhaust steam is again admitted to the accumulator the water will absorb heat. In case the supply of exhaust steam should by any reason be cut off from the accumulator for too long a period, live steam can be admitted by means of a reducing valve. The capacity of the accumulator is such, however, that the turbine will run seven minutes before this valve opens.

In the design of the turbine, as shown by the picture, especial attention was paid to mechanical strength because of the heavy, continuous duty to which these machines are subjected. The wheels are turned from solid steel plates and the buckets are of a non-rusting alloy possessing great mechanical strength. Each bucket is riveted to the rim of the wheel by specially designed rivets. By dividing the turbine into many stages, the steam velocity within the wheel is very low. This prevents the impinging jets of entering steam from wearing the buckets. The turbine being of the impulsive type, there is practically no end thrust, and only a few thrust collars are necessary to locate the shaft, these being placed at one end of the governor bearing. The speed of the turbine is regulated by a spring-balanced fly-ball governor which operates a throttle valve located in the vertical cylinder seen in the illustration. Owing to the low steam pressure, this valve is unusually large. This arrangement gives a regulation especially good, in spite of the sudden changes of load.

The dynamos, of which there are two, mounted on the same shaft as the turbine, were designed especially for this installation by the Western Electric Company, and possess some interesting features. These machines are each 250-kilowatt, direct-current generators, operating at 250 volts. The armatures are of the ordinary ironclad type, but built much stronger.

Due to the high peripheral velocity common to turbine-driven sets, and the high coefficient of expansion in long commutator bars, the diameter and length of the commutator is limited. To avoid any possible trouble, the commutator was divided into two parts, connected by means of tangs. The fields are of the usual type standard in direct-current machines, commutating poles being used because of the high speed and large current. The armature is kept cool by means of fan blades attached to the armature, and, to prevent noise, the frames are enclosed in end bells. One of the strongest features of these machines is their overload capacity. For several hours at a time one of these has carried the entire load, while the other remained idle.



AN EXHAUST STEAM-TURBINE PLANT

TRANSFORMER LITIGATION

Judge Ray of the United States Circuit Court for the Northern District of New York has granted a preliminary injunction against the Middleburg and Schoharie Light, Heat and Power Company in the suit of the Westinghouse Electric and Manufacturing Company against the Middleburg company for infringement of the well-known Stanley patent No. 469,809. The Middleburg company was a user of transformers manufactured by the Pittsburg Transformer Company, it is declared. The operation of the injunction is suspended until November 15th, to permit the Middleburg company either to remove the infringing transformers or to appeal.

HINTS FOR COMMERCIAL TRAVELERS IN SOUTH AMERICA

Consul George A. Chamberlain writes that though the United States sold to the Brazilian port of Pernambuco during 1907 over $1,250,000 worth of goods, only about a dozen American commercial travelers visited the port during the year, eight of them calling at the consulate. The consul thus reviews trade-getting methods:

It seems as impossible to convince American firms who are trying to enter the export market of the importance of good travelers as it is to persuade them to pack merchandise with due reference to the distance it has to travel and to the mode of transportation.

Travelers cannot be had for nothing. The cheap ones invariably turn out to be very expensive and often permanently ruin a market for the careless firm that employs them. Three glaring examples have come directly under my notice during the last 18 months. Two of the three representatives in question had evidently been employed on the sole consideration of a speaking knowledge of Spanish. Their ideas of business methods in general were hazy and they were absolutely ignorant of the simplest formulas of foreign trade. To my surprise they all represented firms well known throughout the United States.

The first of the three came out on an arrangement by which he was to receive $4,000, the first $1,000 in New York, the next at Buenos Ayres, the next at Valparaiso, etc. He spent $700 on his outfit and passage from New York to Pernambuco, and never having heard of a letter of credit, express checks, draft payable to self, or even a money belt, bought three $100 notes and put them away in a cardboard box in his steamer trunk, which was frequently left open during the voyage.

After landing at Pernambuco he discovered that he was penniless, and then began a comedy of errors which lasted for months. He cabled for money; the firm sent $100 to the telegraph office to be wired. It took the firm three months to find out that the money had never been sent and three more to learn that it is impossible to wire money to Brazil through any cable company.

In the meantime the traveler was in absolute distress. Not having received the $100, he continued to cable on borrowed money. The tangle took eight months to straighten out. The firm lost its original $1,000 and the $100 which it tried to wire to Pernambuco and finally sent there by draft. The traveler lost his credit and reputation and has been practically destitute in Rio and Buenos Ayres for a year and a half, unable to get home and sure of trouble if he does. All this through sending one wholly ignorant of specialized work.

The second case was that of an American who arrived at Pernambuco in financial difficulties. He was sent with a fine lot of samples and $1,000 to Rio de Janeiro. To his great surprise he had to pay $600 duties on the samples. He soon exhausted what money he had left and started cabling for funds. His firm wired orders on Brazilian banks, always sending about half what its representative required to meet past obligations. He could not remain idle for two months waiting for proper funds and went ahead, covering all southern Brazil by borrowing from each customer enough to see him to the next town. His firm was well known and he managed to get the money, but with what damage to the credit of his employers can easily be imagined. He was still borrowing when he arrived at Pernambuco and told the writer that he owed sums of $50 and $100 as far back as Rio Grande do Sul, which he had left two months before.

The third case was that of an American who came to grief through being allowed to stay six months in one place and run up $1,000 debt for board and cablegrams before his employers found out that there was something wrong.

These three cases contain several lessons to firms and travelers alike. Inexperienced houses who wish to establish or increase their trade in Brazil should give the following considerations their careful attention:

There is an abundance of trade here always, and that it is worth going after can easily be seen by studying the statistics showing the purchasing power of the country. To secure a share in this trade it is absolutely necessary to send representatives. A deaf and dumb person, however, who knows how to do business and keep cheerful is a far better representative than a linguist who never saw a letter of credit or an order blank.

American firms in arranging to send a man to do $50,000 worth of business whom they cannot trust with a letter of credit for $3,000 should not send him. Remember that a man who travels through South America and keeps his expenses down to $10 a day is doing it cheaply. A bookkeeper on the Amazon gets $500 gold a month and finds it difficult to live within that income.

If the representative of a firm is to be away more than a year he should give bond. It will steady him and his principals will not be so reluctant to back him up when he needs help in an emergency.

People, customs, banking systems and business ways are different in South America from those that obtain in the United States. A traveler in his first trip encounters new and peculiar circumstances, and if he is harassed by improper and insufficient connections with his base of supplies he will fail, and South America will be regarded as being too "pioneering" and too expensive, when the truth is that a cheerful word from home and prompt backing would have saved the situation even after a bad start. It must be remembered that the traveler is on the spot and dealing with a network of trade regulations that are not experienced in the United States. When he lands the custom-house holds his samples until the duties are paid, and they have to be paid in a certain way; sometimes it takes three days, and it always requires a professional dispatcher. When he gets on shore a revenue officer calls for the local tax on commercial travelers. This tax varies in different cities from $30 to $300. Besides these details he will find railways with triple baggage rates. One man paid $50 gold on his baggage from Sao Paulo to Rio de Janeiro, a distance of about 300 miles, only to find later that there is a special scale for sample trunks that would have cut the bill two-thirds.

If one has a good representative who does not talk Portuguese, a line of samples may be given him that will do the "talking."

Advice to Inexperienced Travelers.

For the guidance of the commercial traveler about to visit South America the following schedule of suggestions is offered:

Do not start out before you are an experienced salesman. To be able to take an order automatically and take it right is an essential—just as necessary as to be able to get the order. A slip of the pencil or a little misunderstanding as to terms has often permanently lost a good customer.

Your salary and an average of $10 gold a day for expenses is the least you can work on comfortably.

Map out your trip before starting, remembering always that your time is not money to the people you are going to deal with, and that if you are going to try to hurry them you might as well stay at home.

If you have five days in a town, spend three getting acquainted. You will find that many a merchant who is altogether overstocked when you first see him, if he takes a liking to you, after a few days will find several empty shelves.

If it is your first trip, call at the consulate at once. You can save time by learning there how to clear your baggage, where to put up, by getting a list of firms buying your line and by learning on what days you can get boats or trains to the next port, etc.

If you are empowered to give credits, arrange introductions from the New York branches of the South American banking systems to their different managers. Three concerns would cover the whole coast, east and west. On the east either the London and Brazilian Bank, London and River Plata Bank, or British Bank of South America. On the west coast the Grace system. Consuls are not allowed to give any opinion on the financial standing of firms or individuals, and for such information you will be more or less dependent upon the banks. A letter of credit is the best kind of introduction to a banker.

Do not start out with the idea that you can wire for money at any time. Counting in the charges for cabling and bank discount it costs between $20 and $25 to send $100 to any town in this district, and even then there are few firms at home that know how to go about it.

Keep up your spirits. A quiet, cheerful salesman can place an order in an overstocked house when a gloomy man finds it hard work to draw an order from a merchant who needs the goods. Business is not always exclusively business here; sympathy is apt to be mixed with it.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, July 27.—The new electric railway line in Switzerland, which runs from Chamonix to Martigny, was opened a few weeks ago. The trip through this region, which lies in the neighborhood of Mont Blanc, is a most attractive one, and the line passes by the Montanvert and other glaciers. Starting from Chamonix, the road mounts constantly up to the Col Des Montets, where it reaches an altitude of 4,200 feet. The present line has been built by the Paris-Lyons-Mediterranean Company. One of the most difficult parts of the construction work was the running of a tunnel 5,700 feet long. Underground springs were found, and the water had to be led off by conduits, which run under the railroad tracks. At the station of Vallorcine the French section of the line ends, and the remainder of the road is operated by a Swiss company as far as the terminal station at Martigny, where the electric road joins on to the main Simplon road. The total length of the new line is about 12 miles, and the cost of laying the track was $1,600,000. The trucks of the cars are made of standard pattern, and the car body alone differs. Two-axle trucks are used here, and each axle carries an electric motor. In this way all the train is made up of motor cars, this being an essential condition in order to have the needed adherence upon the grades of the road. This is the first time that a train of any length has been able to mount such steep grades without the use of a rack-rail. Each motor car carries an outfit of controllers, and in a train the motorman is stationed in the front car, and by the aid of a controlling device he is able to operate the motors and brakes of each car.

At Paris there has been a strike prevailing among the workmen who are engaged in the excavation work for the Metropolitan subway and other enterprises, and this work is likely to suffer considerably unless an agreement is reached. The contracting firms maintain that they cannot comply with the conditions stipulated by the workmen's syndicate, and propose a general or at least a partial lockout. The question is pending at the present time and is one which is of great interest, owing to the extent of the work on the different lines of subway in the city.

Some of the telephone subscribers in Paris have been in the habit of disconnecting their instruments during the night and at certain times in the day, by means of removing the receiver from its hook and letting it hang down. In this way they are not disturbed by telephone calls at undue seasons, which may be an advantage; but, on the other hand, this practice cannot be maintained without damage, for when the receiver is taken from the hook the lever puts the battery in short-circuit, and it soon becomes exhausted. The administration discovered the fact owing to the complaints of the subscribers that their instruments failed to work, and this was due to the above reason. It admits that the subscribers should be allowed to shut off their telephones when so desired, and proposes to accommodate them in this respect. According to a circular which has been distributed, a subscriber can have a switch mounted free of charge upon the circuit of the call-bell, so that the latter can be cut out very easily.

The German army proposes to pay great attention in the future to the use of airships and balloons in the maneuvers and also to the use of radio-telegraph apparatus in order to signal between the balloons and the ground. During the coming grand maneuvers the technical corps will use the most recent discoveries, such as the telescope, photography at a distance, radio-telegraphy and powerful searchlights, for the purpose of showing the enemy's position. Automobile wireless posts will no doubt figure in this case. Not long since some interesting experiments were carried out between the main wireless post of Nauen and two balloons, one of which was an airship, and good results were obtained. These trials are being continued at present. A. de C.

GREAT BRITAIN

London, July 31.—The accounts of the London County Council tramways for the year to March 31, 1908, show a net balance of about $225,000 after meeting debt charges. There are now 119¾ street miles of line and the passengers carried amounted to 372,515,754. The generating expenses at the Greenwich power station were two cents per kilowatt-hour.

The bulk-supply bill for London, which occupied so much time at the hands of the committee of the House of Lords, has passed the ordeal of a second reading in the House of Commons, thanks, in the main, to the support of the government. The attitude now taken up by the government is that, although it would prefer a complete municipal scheme, as this is not forthcoming it would not be wise to deprive Londoners the right to have a cheap supply of electric power at the hands of a company, provided sufficient safeguards are inserted in the bill with regard to purchase, and so on. In fact, it is to be an instruction to the committee of the House of Commons, which will now consider the bill, to insert the name of the London County Council as the purchasing authority in 1931, and, by the way, the existing rights of local authorities to purchase the lighting companies' undertakings at that date are also to be transferred to the London County Council. Thus we are at last within sight of a really workable scheme.

An amusing telephone claim and counterclaim was heard last week at the Brighton County Court. Colonel Gourard, who is not unknown on the other side of the Atlantic, was sued for a few pounds, the rental of a telephone, and he retorted with a counterclaim for $50,000, on the ground that the bad telephone service prolonged an illness of his; he also made many other claims of a similar character. The telephone company won.

Considerable discussion has been taking place lately with regard to the position of the electrical industry in Great Britain and the means necessary to put things in order a bit. Some time ago Mr. E. Garcke propounded the idea of an electrical league, with somewhat ill-defined objects, but it fell to the ground. This, however, has been resuscitated by a group of other gentlemen, who have formed themselves into a committee, and it is proposed to extend an invitation to join the league to anyone who is in any way interested in electricity, whether shareholder, consulting engineer, town councilor, municipal-station engineer, manufacturer, contractor or trader, whether employer or employe, and every endeavor will be made to work in harmony and co-operation with all established electrical societies.

The Board of Trade is making inquiries into the possibility of fitting speed indicators on all electric tramcars.

For some time the London County Council has maintained a gas-driven generating station for the lighting of Victoria Embankment, but it has decided to abandon this in favor of taking a supply from one of the lighting companies. The chief reasons which have brought about this result are that larger offices are required for the electrical testing staff and also it will be cheaper.

An issue of $5,000,000 five per cent. prior-lien bonds is being made by the Underground Electric Railways Company of London, as part of the new scheme for reorganizing the finances of the concern.

The half-yearly railway accounts are now being issued. With regard to the Central London tube railway, it is curious to note that, while the number of passengers has diminished, the revenue has increased, but this is due to the extra traffic for the Franco-British Exhibition, which involves paying the maximum fare. The Metropolitan Railway Company also reports a decrease in the number of passengers carried, which is again attributed to tubes, trams and motor omnibuses. The District Railway affiliated tube companies are doing quite well, and there are signs that the routes chosen will eventually prove the right ones from a traffic point of view.

At meetings of the General Electric Company and Messrs. Crompton & Co. the annual complaint was made of the serious condition of the electrical industry, and, in the case of the former, the chairman, Mr. Byng, expressed the strong conviction that no improvement could be expected until our fiscal system was altered. This company has a rather genuine complaint as to the bad support given to its carbon factory, which is the only one in the country. The Admiralty has given somewhat strong support, but, so far as the municipalities are concerned, very little can be done with them. Of course, it is all a question of price, hence the grumble as to the evils of foreign competition.

In connection with the competition between the General Postoffice and the National Telephone Company's systems in London, it is interesting to note that in December last the Postoffice had 46,355 stations and the company 93,020, while in June the corresponding numbers were 49,690 and 99,068, thus showing an increase of 3,355 on the Postoffice system and 6,048 on that of the company. G.

NEW ENGLAND

Boston, August 8.—Boston Elevated is one of the few Massachusetts roads that show gains for the last fiscal year in spite of the business depression. By economies introduced in the matter of operating expenses the road shows today net earnings about $400,000 in excess of those of last year, it is stated.

The Berkshire Street Railway Company has filed a petition asking authority to issue $80,000 stock in addition to $285,000 petitioned for earlier in the year, and not passed upon as yet, making a total of $365,000. The $80,000 will all be spent for extensions and improvements.

The bridge over Spruce Creek in Kittery, a trestle structure on the line of the York Beach electric railway, near the Portsmouth (N. H.) Navy Yard, which was burned last week, stopping all traffic on the road, was rebuilt in 36 hours. The new structure is 185 feet long.

Several changes have been made by the New England Telephone and Telegraph Company in its executive methods and divisional arrangements, separating the commercial, plant and traffic departments. The Boston representatives of these three departments hereafter will be James H. Barry, superintendent of commercial affairs, embracing all dealings of that nature with the public, who comes to Boston from the Central division, where he had headquarters at Lowell and Worcester; I. O. Wright, assistant general superintendent of the plant department, former superintendent of the Boston division, who will direct construction and maintenance in the Southern Massachusetts division, and William E. Farnham, manager of traffic department, formerly in that capacity for the Boston division only, but now in charge of the Southern Massachusetts division also.

On Tuesday last two cylinder heads on a 600-horsepower engine at the station of the York Electric Light Company in Biddeford, Me., blew out, causing damage estimated at $5,000.

Deane B. Small, who has been superintendent of the Manchester (N. H.) district of the New England Telephone and Telegraph Company, has been advanced to the position of division superintendent, with headquarters at Portland, Me.

The Milford Electric Light and Power Company asks approval of the state commission for an issue of $40,000 first-mortgage bonds.

The extension of the Boston and Worcester Electric Railway Company's lines into Natick will be completed about September 1st, and the double-tracking at Framingham will be finished also about the same time. B.

NEW YORK

New York City, August 8.—Hereafter complaints of faulty electric-light meters will be dealt with by the Public Service Commission just as are complaints against gas meters. A laboratory has been provided in which is installed the necessary apparatus, and the testing of meters has already been begun. Under the law by which the Public Service Commission was created a meter which upon test registers within four per cent. of accuracy is deemed to be correct. This applies to slow meters as well as to fast ones. The law also provides that a fee shall be charged for the testing; the fee, in the first place, to be paid by the consumer when he makes the complaint, and to be returned to him if the meter is found to be inaccurate to the consumer's prejudice to the extent of four per cent. or over. If, however, it is only 3½ per cent. fast, or if it is slow, he loses his fee and the installation of a new meter is left to the company's discretion. The commission has fixed a scale of fees to meet the varying conditions to be found in the city based on the ampere capacity of the meter. This scale of fees is as follows:

For a meter with a rated capacity of 10 amperes or less.	$1.50
For a meter with a rated capacity of 15 amperes or less.	2.00
For a meter with a rated capacity of 25 amperes or less.	2.50
For a meter with a rated capacity of 50 amperes or less.	3.00

For each additional 25-ampere capacity or fraction thereof the charge will be 50 cents in addition to the above. It will be the purpose of the commission to test all electrical meters complained of under actual conditions of use.

Frank W. Stevens, chairman of the Public Service Commission for the Second District, has decided that electric plants operated by individuals which perform a public service even though not incorporated, come under the jurisdiction of the commission. The decision arose in an attempt of the lighting corporation of Onconta to put out of business a private lighting plant.

Officials of the Radio Wireless Telephone Company assert that wireless-telephonic communication will be established between New York and Philadelphia within a month. The Quaker city antennæ will be attached to the flagpole of the Land Title Building, Broad and Chestnut streets, and will communicate with a wireless telephone station on the Terminal Building, New York.

"Drop a nickel in the slot and get a car ride" will be the order of things on some of the cars on the Third Avenue Railroad system by the first of the year. The 150 pay-as-you-enter cars which Receiver Frank Whitridge has ordered from J. G. Brill & Co. of Philadelphia are to be equipped with a fare box. The new cars will be similar in type to the pay-as-you-enter cars now in operation, but they will be of lighter build and equipped with minor improvements that the present cars have not. It is expected that 100 of the new cars will be ready in November.

Cars three-quarters empty, hundreds of persons walking, and many disputes with conductors, marked the first day's independent operation yesterday of the Central Park North and East River Street Railway Company. Without even waiting for the completion of the appraisement of the street-car properties the Public Service Commission has taken action looking toward the restoration of the transfer system. A formal order was served on the companies to show cause why they should not enter into a joint agreement and restore the transfer system. W.

SOUTHEASTERN STATES

Charlotte, N. C., August 8.—The Georgia Manufacturing and Public Service Corporation has been placed in the hands of James T. Anderson of Marietta, Ga., as receiver. The company supplied the city of Marietta with lights and water.

A big reorganization plan is being undertaken in Richmond, Va., involving the Virginia Passenger and Power Company, the Richmond Passenger and Power Company, the Richmond Traction Company and allied or controlled interests, and the committee which has the undertaking in hand has deposited the proposed reorganization plan with the Bowling Green Trust Company and has given notice to the holders of the securities involved to deposit the same before September 3d. It is proposed that the new company shall have $7,500,000 of common stock and $5,000,000 non-cumulative preferred stock. A $15,000,000 bond issue is also proposed.

Tarboro, N. C., will enlarge its electric-light plant, and J. A. Weddell has been instructed to purchase duplicate machinery.

Mr. H. H. Carr has been made general manager at Raleigh, N. C., of the Carolina Power Company, which was recently chartered, and which will have headquarters in Raleigh. The capital is $3,750,000, and the power to be distributed is being developed at Buckhorn Falls. The company also takes over the Raleigh street railway, it is said, including the city lighting plant. The Buckhorn power will be transmitted a distance of 28 miles to Raleigh.

The Southern Power Company, Charlotte, N. C., has closed a contract with the town of Chester, S. C., to take over the old electric-light plant and to supply the town with electric lights. Power will be brought from Great Falls.

An electric plant and other improvements are being installed at Lakeview, N. C., where it is proposed to develop a resort place in the near future. P. L. Gardner is interested in the undertaking.

The Southern Power Company has formally petitioned for the right to enter the manufacturing town of High Point, N. C., to furnish lights and power, and has given notice that a franchise will be sought.

The Southern Power Company has secured right-of-way to the city limits of Greensboro, N. C., and will apply for a franchise to run its transmission lines into the city within a few weeks, it is said. The company is further reported to be negotiating on a contract to supply the city with lights and power for municipal purposes. L.

MICHIGAN

Detroit, August 8.—The United Telephone Company, an Independent company, has been organized at Ludington to take over the property of the Lake Shore Telephone Company in Mason County. A site for an exchange has been purchased in Ludington, and $80,000 will be spent in that city. All of the lines will be rebuilt and the rural lines changed from ground to metallic circuit.

The proposed interurban line between Saginaw, Lansing and Owosso has been brought to a standstill, owing to the fact that right-of-way could not be secured in Saginaw County over land owned by Saginaw parties.

The Toledo and Ottawa branch of the Northern Railway Company, which recently secured a franchise in Monroe, has begun surveying different routes from its present terminus to Monroe.

The Toledo and Michigan Company, which was planning a road from Adrian to Coldwater, has been reorganized. The new company will take over the property of the old company and amend the charter, so that the line can be extended to Jackson. D.

INDIANA

Indianapolis, August 8.—The Marion and Logansport Traction Company, a new organization, has filed articles of incorporation with the secretary of state. The company is capitalized at $40,000, with principal offices in Marion. It intends to build a traction line in Grant, Miami and Cass counties.

The St. Joseph Valley Traction Company of Goshen announces its intention to build a line from Middlebury into Elkhart, by way of Bristol, giving the road a western terminus and connections. Agents are now securing the right-of-way, and the majority of the farmers are willing to grant this right-of-way free of cost. Elkhart business men have signified their intention of purchasing the right-of way from the few farmers who are demanding a price for their land.

It is announced that the construction of the Cleveland and Indianapolis interurban railway from Norwalk, Ohio, to Bluffton, Ind., has been financed, and plans have been perfected for the early completion of the line.

The City Council of Anderson has released the

Indiana Union Traction Company from a $20,000 bond that it would expend $125,000 on the erection of car shops in that city. The agreement has been fully complied with, and shops erected which cost $135,000. The next agreement to be complied with is the construction of an extension of additional lines from Middletown to Newcastle, and from Anderson to Frankton and Elwood. The company has a year in which to complete these conditions, when the franchise will be continued until 1952.

The Indiana Railroad Commission has sent out a circular requesting interurban-railway companies to take all possible steps to warn people who use the tracks within the limits of cities and towns as a footway to desist from so doing. The commission calls attention to the fact that many fatal accidents have occurred on account of the illegal use of railway rights-of-way. The commission recommends that the interurban officials apply to the city officials to pass ordinances to prevent the use of tracks in going to and from shops by laboring men and others when not necessary.

The interurban railway companies entering the city of Lafayette have notified the City Council that they will refuse to comply with an ordinance compelling them to maintain electric lights at street crossings, at least until the state Supreme Court declares that the statute providing that cities might pass such ordinances is constitutional.

The Indiana State Tax Board has increased the assessment of the Michigan City Gas and Electric Company from $88,000 to $250,000.

The Palmyra Home Telephone Company of Palmyra, with a capital stock of $7,500, has been incorporated to construct and operate telephone lines and exchanges in the counties of Harrison, Floyd and Washington, with principal exchange in Palmyra.

The Richmond division of the Pennsylvania Railroad Company has decided not to install telephones for the purpose of transmitting train orders. The officials say that this plan of using a telephone for dispatching has been tried by them, and they do not consider telephones as good and reliable as the telegraph. They say it is hard to hear over the telephone when the weather is bad, and in winter, when the wires are ice-covered and weighted down with snow, telephonic use of the wires is difficult. Furthermore, experience shows that telephones would not prove satisfactory, as in the transmission of messages words are likely to become unintelligible and fatal mistakes might be made, whereas, when the telegraph is used, each letter comes over the wire, and the receiver cannot make a mistake unless he is ignorant of the code or does it through carelessness.

The Citizens' Telephone Company of Decatur has entered upon the work of moving its telephone lines between Decatur and Fort Wayne. This has been made necessary because its lines were too close to the Fort Wayne and Springfield line, which is a three-phase transmission, and this proximity greatly interfered with the transmission of messages between Decatur and Fort Wayne. The managers of other telephone companies connected with the Citizens' company notified the officials that unless the interference was remedied, they would have to sever connection with the company because of the many complaints of poor service by their patrons. For several miles out of the city the lines will be moved only a short distance. The remainder of the line will be moved about two miles east across St. Mary's River. A suit is pending in court against the traction company for damages, because the telephone company was first to occupy the territory. There is much interest manifested in this suit, and hope is entertained that the court will decide the question of priority of rights in such a case. However, it is generally believed that the traction company will pay the cost of moving the telephone wires and that the suit will be dismissed. S. S.

NORTHWESTERN STATES

Minneapolis, August 8.—Subscriptions for $16,000 worth of stock in the proposed Sioux City and Spirit Lake interurban have been made in Le Mars, Iowa, and there is little doubt but that the total subscriptions for this town will reach $25,000.

Preliminary location work on the interurban between Des Moines and Harlan, Iowa, has commenced under the supervision of C. L. Persons, engineer, of Chicago. The Interurban Association, organized in Shelby County, has made an assessment of 50 per cent. to pay for the first work along the line.

The Red Oak and Northeastern Interurban Promotion Company of Red Oak, Iowa, is negotiating with a competent engineer to make a preliminary survey for the road to be built between Red Oak and Des Moines.

A. G. Anderson of Fergus Falls, Minn., is planning to construct an electric road between that city and Wendell, and eventually to Wheaton, Minn.

The Union Engineering and Construction Company is making rapid progress on the dam at Fergus Falls, Minn. When finished Fergus Falls will have the cheapest electric light of any city in the Northwest, it says.

The City Council of Brainerd, Minn., has passed resolutions condemning the plant of the Minnesota Waterworks Company and asking for bids on a bond issue of $120,000 for the construction of a pumping plant. George Cadogan Morgan offers to furnish the city with power for electric lights and pumping water at about one-third less than the city can produce it.

The Twin City Rapid Transit Company is building 50 pay-as-you-enter cars at its shops on Snelling Avenue, St. Paul.

Entrance will be effected into Duluth by the Arrow Line, a new third-rail system, about July 1st next year.

The contract for rebuilding the Hauser Lake dam, 18 miles from Helena, Mont., has been let to Stone & Webster of Boston, and work has been started.

The Consolidated Power and Light Company has commenced carrying out plans for the electric decoration of Deadwood, S. D., during the coming Pa-Ha-Sa-Pa carnival.

It is probable that the Winnebago Traction Company of Oshkosh, Wis., and the Eastern Wisconsin Railway and Light Company of Fond du Lac, Wis., will become associated with headquarters at Oshkosh after the return of Emerson McMillin, the president, from Europe.

W. B. Bucher of Martintown, Wis., has the contract for lighting Winslow with electricity.

It is reported that 270 telephone wires of the Wisconsin company were put out of commission in the neighborhood of Glenwood, Wis., by a recent electrical storm.

The Plattsmouth Telephone Company will erect a one-story, pressed-brick building at Elmwood, Neb., to be used as a telephone exchange.

Jordahl & Murphy of Devils Lake, N. D., received the contract for stringing 27,000 feet of insulated wire and laying the conduit pipes at the military grounds.

The attorney-general of Minnesota rules that telephone companies may properly refuse to allow their wires to be cut for the removal of buildings unless the housemover pays the cost which the telephone company demands.

The Aitkin Telephone Company of Aitkin, Minn., proposes to rebuild its system and install a new board. It has asked a new franchise of the Council as a condition to making the improvement.

An ordinance has been introduced in the Council of St. Paul providing for regulating telephone charges, and making a maximum charge of $4 for business service within two miles of the center of town. Residence service within the two-mile limit shall not exceed $30 per annum and for each half-mile additional a maximum of 20 cents a month is allowed. Desk extensions are to be limited to an extra charge of $6 a year.

The Iowa Telephone Company is progressing with the work of putting in underground conduits for its city cables at Clinton, Iowa, and it is hoped to have the work completed before cold weather sets in.

The Scott County telephone picnic will be held at Pinneo's Grove in Princeton, Iowa, on August 26th.

The Bloomfield Telephone Company, capital stock $20,000, of Bloomfield, Iowa, has been incorporated by W. J. Steckel, secretary and treasurer, and others to take over the old Davis County Telephone Company, which has been in the hands of a receiver. It will expend $7,000 to $8,000 in repairs and for new equipment. R.

MEXICO

Mexico City, August 6.—The Mexican government is making an important enlargement of its waterworks system for this city by installing five large electric pumping stations at the source of the water supply at Xochimilco. The first of these stations was placed in operation recently. The power for the stations will be supplied by the Mexican Light and Power Company from its great hydro-electric plant at Necaxa. When their erection is completed the five stations will be provided with electric motors, direct-coupled to their respective pumps, and have a total normal capacity of 3,060 horsepower, capable of a maximum of 5,222 horsepower, providing for overload capacity. The first pumping station, called Condesa, is equipped with three large synchronous motors of 1,200 horsepower each, making 720 revolutions per minute, and pumping 850 liters of water per second. Two motor-generator sets supply the direct current for exciting the fields of the three motors, and all necessary switchboards, lightning arresters, etc., are installed. Nine oil-insulated transformers are installed, being three to each motor, for the purpose of reducing the voltage provided by the Mexican Light and Power Company's circuit to that required by the motors. The second station, called La Noria, will be equipped with two 60-horsepower motors, pumping 300 liters of water per second. The third station, called Nativitas, will have two 160-horsepower motors, pumping 600 liters of water per second. The fourth station, called Santa Cruz, will have two 120-horsepower motors, pumping 700 liters of water per second. The fifth station, called San Luis, will have two 356-horsepower motors, pumping 800 liters of water per second. The motors in every case will be 3,000 volts. These pumping stations are being erected with a view of attractiveness as well as usefulness and durability.

The Compania de Tranvias Luz y Fuerza de Guadalajara is preparing to install a large amount of new electrical machinery at its hydro-electric plant at Juanacatlan, near Guadalajara, in order that it may be able to meet the growing demand for power. The first of four new generators will soon be installed at this plant. This company is a merger of the two electric power companies that formerly operated plants at Guadalajara. It not only furnishes light and power for the city, but also operates the electric-railway system that was recently built there.

One of the greatest hydro-electric power enterprises now on foot in Mexico is being promoted by a syndicate of British capitalists who are heavy stockholders in the Kansas City, Mexico and Orient Railroad, which is being built through the western part of this country. This syndicate, represented by A. M. Nelson, a civil and electrical engineer, of Chihuahua, Mexico, has made application to the Mexican government for a concession for the project. The surveys for the proposed plant have been made and were submitted to the government for formal approval, along with the application for the concession. It is planned to install the hydro-electric plant on the Fuerte River, in the state of Sinaloa, near the new railroad now being constructed through that section. A large dam will be built across the river and about 10,000 horsepower developed. This power will be transmitted to a number of mining camps, situated within a radius of 50 miles. It is stated that the money for the enterprise has been subscribed and that the preliminary plans for the building of the dam and the erection of the plant are completed.

The Tramway, Light and Power Company of Puebla has acquired the holdings of the other electric companies operating in that city. The City Council, in approving this merger, stipulates that at least 80 streets of the city must be made free of overhead cables at once and these cables placed underground, and that the cables must be removed from the other streets as fast as the work can be done. The contract between the company and the city also stipulates that within five years the company will have at least 15,000 horsepower at the disposition of the municipal government and the citizens of Puebla.

The Compania Agricola y Colonizadora of Chihuahua is preparing to install a large hydro-electric plant on the Conchos River in the district of Camargo, state of Chihuahua. The power will be used to operate the industries of the company and will also be transmitted to other towns of that section where there is a demand for electric power.

Gonzalo Carranza of Mineral de Ocampo, state of Chihuahua, will install a hydro-electric plant on the Nevosaigame River, that state, for the purpose of supplying power for a number of mines of that section. He recently applied to the federal government for a concession for the proposed enterprise.

A hydro-electric plant is to be established on the Escondido River, in the state of Chihuahua, by the Compania Carbonifera de Rio Escondida. The company will take the water from the river at La Fiesta and convey it through a canal about 9,000 feet long to the site of the hydro-electric plant.

A new electric-light plant was recently installed in the town of Encarnacion de Diaz, state of Jalisco.

The towns of San Cristobal de las Casas and Comitan, both in the state of Chiapas, are now lighted by electricity. The plants in these towns were placed in operation a few days ago.

Juan Alonzo has taken the preliminary steps to install a hydro-electric plant on the Molina de Calderon River in the state of Mexico. His application for a concession for the project is now pending before the federal government. H.

WESTERN CANADA

Winnipeg, August 8.—The long-distance telephone line between Winnipeg Beach and Gimli, which has been built by the Manitoba Telephone Commission, is completed and in operation.

Sealed bids will be received by John Harrower, secretary-treasurer, Baldur, Man., until noon, August 21st, for the construction of a rural-telephone system throughout the municipality of Argyle, according to plans and specifications, which may be seen in the municipal offices at Baldur and also in the offices of the Manitoba Telephone Commission, Winnipeg, Man.

The Kootenay Development Syndicate has been granted a license in British Columbia to do business in the province. R. S. Lennie of Nelson, B. C., is agent for the company. The powers granted the concern provide for the development of water-power and the distribution of electrical energy and permit the company to acquire or construct electric street railways.

A meeting of the Council of the municipality of Miniota was held at Crandall, and the preliminary arrangements completed for a rural telephone system. The rates will be $18 a year.

The municipal telephone system at Edmonton, Alb., shows a surplus of $5,315.76 for the last six months.

Fort William has sent a check for $51,000 to Port Arthur for that portion of the municipal street-railway system running in Fort William.

R.

PACIFIC SLOPE

San Francisco, August 6.—The Northern Electric Company, which has an extensive electric-railway system connecting Chico, Oroville and Marysville, Cal., has moved its general offices to the Alaska Commercial Building, 310 Sansome Street. The Home Telephone Company of San Francisco, which has a six-story steel-frame central-office building under construction on Grant Avenue, has also moved its offices into a handsome suite in the Alaska Commercial Building.

The Great Western Power Company recently secured a building permit for a sub-station in the eastern part of Oakland. Reinforced concrete will make the structure fireproof, an important matter, as high-tension switches and large transformers are to be installed there. This company is making good progress on its very long high-tension power line from the generating plant at the Big Basin of the Feather River to San Francisco. Officials say that the plant may be ready to turn over by November. At that time current will be supplied as far as the transmission line is completed.

Advices from Redding, Cal., say that the flow of water in the mountain streams has fallen off this summer and that some of the hydro-electric plants in Northern California are running with their capacity considerably curtailed. The shortage of water is due more to the light fall of snow in the high Sierras last winter than to the hot weather that has prevailed recently. The Northern California Power Company is short of its usual amount of water for the generation of power at its three plants, but the management claims that there is no fear of a shortage of power, as far as its customers are concerned. The company has been generating considerably more power than it could sell in its home territory, covering Shasta, Tehama and Glenn counties, and it has been disposing of its surplus to the Bay Counties Power Company, making delivery at Chico. The worst that can happen in this case is said to be the shutting off of the supply now being furnished the Bay Counties company. The management of the Shasta Power Company says that it has more water than it can use, the only effect of the hot weather being to increase the supply, as its source is in the snow banks of Mount Lassen. This company sometimes has its water supply threatened in winter by the ice, but never in the summer.

The Pacific Gas and Electric Company's new Deer Creek hydro-electric plant is now in successful operation to the extent of 8,000 horsepower. The current is transmitted via Alta to the points where it is needed along the extensive network of the company's power lines, reaching to San Francisco Bay. The company pushed the completion of this fine installation in order to have it to fall back upon during the dry season.

A representative of the Northern Power and Light Company says that good progress has been made on the stringing of its power-transmission lines in Northern California. Standard aluminum wire is being used. The wires are now in position from the power plant to Redding, a distance of 26 miles. In that town they end just below the Shasta Power Company's sub-station at a point where the Northern Power and Light Company will build its sub-station. The main pipe line to convey the water from the mountain falls to the power house on Cow Creek is now being laid. Some machinery is yet to be installed at the plant and the sub-station at Redding is yet to be built. It is supposed that current will be delivered in Redding some time this fall.

It is announced that the H. E. Huntington syndicate, which controls nearly all of the electric-railway trackage in the southern end of California, has taken over the Redlands Central electric road in that part of the state. The Huntington syndicate is now building a line to connect San Bernardino with Riverside, via Colton. A. C. Denman has also disposed of his electric-railway interests to the Huntington interests and has resigned his position with the San Bernardino Valley Traction Company. He has been succeeded by Chief Engineer Kuhrts of the Huntington properties.

City Engineer Hoxie of Fresno, Cal., estimates the cost of replacing the present hanging arc lights in the business section of the city of Fresno with 308 electroliers at $38,500 for the electroliers and $7,700 for the necessary wiring, bringing the total to $46,200.

A.

PERSONAL

Mr. John C. Hardy has been appointed manager of the St. Paul (Minn.) exchange of the Northwestern Telephone Exchange Company, succeeding Mr. C. W. Rees.

Mr. J. S. Speer, president and general manager of the Speer Carbon Company, St. Marys, Pa., manufacturer of motor and generator brushes and other carbon specialties, was in Chicago last week.

Mr. John H. Harding has become president of the Laporte (Ind.) Electric Company, following the resignation of Mr. Charles H. Truesdell, after a service of 12 years in that capacity. Mr. Harding has been the general manager of the company for several years.

Mr. F. D. Hunt, who will become traffic manager for the Portland (Ore.) Railway, Light and Power Company, was given a dinner by business friends in Kansas City, Mo., on the occasion of his resignation as local agent of the Kansas City Southern Railroad.

James E. Tate of Baltimore, Md., who was associated with the Maryland Electrical Supply Company and the Witherbee Igniter Company, in the electrical equipment business, died of pneumonia last week. Mr. Tate was prominent in the club affairs of the city and was a well-known yachtsman.

Mr. Albion E. Lang has been elected president of the Toledo Railways and Light Company to succeed Mr. H. A. Everett of Cleveland, resigned. The company has been recently reorganized and is now said to be upon a highly satisfactory basis. Mr. Lang was president of the American Street Railway Association ten years ago.

Mr. Dugald C. Jackson, professor of electrical engineering in the Massachusetts Institute of Technology, Boston, is in Chicago, where he has been called as a technical adviser of the city of Chicago in the matter of preparing a scientific system of keeping accounts between the city and the Chicago Telephone Company under the new telephone ordinance.

Mr. James F. Heyward has been elected vice-president and general manager of the Maryland Electric Railways Company, with headquarters at Baltimore. Several years ago he was general manager of the City and Suburban Railway of Baltimore, but resigned shortly after that road was merged into the United Railways Company. He has recently been in the street-railway business in Oil City, Pa.

Nevil Monroe Hopkins, professor of electrochemistry at George Washington University, Washington, D. C., has a complete detective novel entitled, "The Investigation at Holman Square," in the September Lippincott's Magazine. The arch criminal in the story makes use of his electrical knowledge to further his plans, which are circumvented at the last by a detective, who is also an expert in that line.

Mr. B. W. Arnold, who, since June 1st, has been superintendent of the Lincoln, Champaign and Bloomington divisions of the Illinois Traction System, with his headquarters at Springfield, has been promoted to the position of superintendent of all the lines south of Springfield, and has entered upon the duties connected with the office. He will now have his headquarters at Staunton, Ill. Mr. W. W. Street, recently superintendent at Staunton, will succeed Mr. Arnold at Springfield.

Mr. A. H. Kimball has resigned his position as superintendent of the Fitchburg (Mass.) Gas and Electric Light Company to become the manager of the Fall River (Mass.) Electric Light Company. Mr. Clifton R. Hayes, a graduate of Worcester Polytechnic Institute, has been chosen to succeed him at Fitchburg. Mr. Henry F. Coggeshall, treasurer and manager of the Fitchburg company, who has been with the concern since it was established, has tendered his resignation on account of failing health, to take effect at the close of the year.

Mr. Thos G. Grier of Chicago, who recently visited Panama and who has written a book "On the Canal Zone," has written a letter to the Chicago Evening Post calling attention to the rapid work that is being done in the Panama Canal construction under the direction of the army engineers. For instance, in July, 1908, 3,168,640 cubic yards of earth was excavated, a greater quantity than was taken out in an entire year prior to the putting of the army men in charge of construction. The rapidity of the excavating work is so remarkable as to approach the marvelous. The canal will be finished, probably, long before the time originally set for its completion. In editorial comment the Post says: "When the canal is completed and turned over to the government the names of three army officers—Goethals, Sibert and Gaillard—will be linked with the history of a gigantic work successfully done."

ELECTRIC LIGHTING

S. G. Major has been granted a franchise for an electric-light plant at Kearney, Mo.

Cashmere, Wash., has voted bonds for $10,000 to install a water and electric-light plant.

The Wisconsin Railroad Commission has issued an order fixing standards for gas and electric service in the state. The standards are in the form of a set of 25 rules.

The Jackson Electric Light and Hydraulic Manufacturing Company has been organized in Breathitt County, Ky., with a capital of $20,000. The incorporators are L. P. Gum, J. W. Norwood and A. S. Moore, all of Lexington.

The Edison Electric and Illuminating Company of Tiffin, Ohio, has increased its capitalization from $50,000 to $150,000, because of extensive improvements about to be made at the plant. The buildings will be added to, and new equipment put in.

The Peoria Gas and Electric Company has completed the remodeling of its offices and had an opening of the new salesroom on August 10th. Half of the company's frontage on North Jefferson Street is used for a showroom, in which gas and electric appliances are exhibited. The opening day was "souvenir day" for the ladies, and every lady who called was given a souvenir—something useful for the kitchen. Among these gifts were electric flatirons, Hylo lamps and 10 kilowatts of electricity.

The low-efficiency objection to the illumination of the streets of residential districts by units of low intensity distributed at frequent intervals has been removed by the introduction of the series tungsten lamp, which has an efficiency of 1½ watts per candlepower. A series system utilizing tungsten lamps is fully described in Bulletin No. 4607, just issued by the General Electric Company, Schenectady, N. Y. This description includes illustrations and general data on transformers, switchboards and line fittings.

From Paris cable dispatches it is learned that the brilliant capital was in darkness two hours on the night of August 6th, when the electric lights of the city were extinguished as a result of a strike among the electricians. The director of the lighting plant had refused their demands and the men walked out after cutting off all the power. Later they returned after being threatened with permanent suspension if the strike continued. It was without warning, at nine o'clock, just when the theaters, music halls, cafes and boulevards were filled, every electric light in the city went out. Street cars were stalled and there was consternation in the newspaper offices, whose editorial rooms are lighted and presses run by electricity. Much crime was reported throughout the city during the darkness.

ELECTRIC RAILWAYS

The El Reno (Okla.) City Railway Company has applied to the City Council for a four-year extension of its franchise.

The Central Texas Traction Company has been incorporated for $300,000 by a number of Texas men, headed by J. J. Sears, Aledo.

The promoters of a gasoline-electric traction line from Swayzee to Elwood, Ind., have applied for a franchise through townships the proposed road will traverse.

Nearly all of the right-of-way has been secured for the Shawnee-El Reno (Okla.) interurban railway, and construction work will be begun within a short time.

The Commercial Club of Chickasha, Okla., has pledged to raise the necessary amount for the construction of a city electric railway and also for an interurban line to Oklahoma City.

It is said that $750,000 of the needed funds to construct the Findlay-Marion (Ohio) electric railway has been secured, and that as soon as another $250,000 is raised the work will proceed.

The road bed and bridge work on the Franklin division of the Nashville Interurban Railway is almost complete. The General Electric Company has contracted to deliver the electrical equipment by September 15th.

The Iola Electric Railway, operating a street-car and interurban line, from Iola, Kan., to Gas City, La Harpe and Concreto,, has been purchased by the Kansas Southern electric line and will be extended to Pittsburg, Kan.

The United States consul in Manchuria reports that plans for the electric railway which is to be built by the South Manchuria Railway Company, are beginning to take definite shape, and tenders for the supply of materials will shortly be called for. The estimated cost will be about $1,000,000, and the chief electrical engineer of the company is expecting to visit the United States to study the latest developments in the street-railway business in order that the road may be made thoroughly up-to-date.

The Coalgate, Sulphur and Western Railway Company has been incorporated. A. C. Frost is president of the company. The proposed line will run from Sulphur, Okla., to Oklahoma City and from Sulphur to Coalgate through the mining district.

The excessive heat of the sun at Findlay, Ohio, caused the rails of the street-railway company to expand on August 3d to such an extent that they were thrown out of position. Many of the spikes were torn loose, and the line was put out of commission until repairs could be made.

The state Railroad Commission has taken up the case against the Pere Marquette Railroad for refusing to give physical connection with the Michigan United Railways Company at Lansing, Mich. A similar complaint has developed against the Grand Trunk at Marshall. The steam roads have refused to transfer cars onto the tracks of the electric line.

The Cleveland, Columbus and Southwestern Traction Company announces officially that the entire line from Cleveland to Galion, Ohio, will be in operation by the last of the present year. This, with the northern extension of the Columbus, Delaware and Marion Railway, now completed to Bucyrus, will open a new traction line from Cleveland to Columbus.

The property of the Winnebago (Wis.) Traction Company has been sold for $950,000, under foreclosure proceedings. It is the intention to reorganize the company with Clement C. Smith of Milwaukee as president. An association of interests of the traction company and the Eastern Wisconsin Railway and Light Company will be formed within a short time, it is expected.

Colorado Springs, Colo., is to be connected with the South Platte Canyon resorts by a new electric railway, which will run from Denver to Colorado Springs by way of Roxbury Park, a new resort in the western part of Douglas County, in the vicinity of Rogers Peak. The contemplated route follows the South Platte for a distance of 25 miles and will present a line of unusual scenic beauty. Five miles of road has been built.

Mining men in the central Idaho districts wish to see an electric railway built from Orogrande and Elk City down the south fork of the Clearwater River to Camas Prairie and there connect with a line to Lewiston. O. G. Kinny, secretary of the Butte and Orogrande Mining Company, is handling the interests in Idaho and Spokane. The new road will be known as the Elk City, Lewiston and Spokane Electric Railway. Stock to the amount of $200,000 has been subscribed for, and, it is said, engineers will be in the field inside of 30 days.

The Evening Capital of Annapolis, Md., dated August 1, 1908, under the caption "Official Route of Red Men—Washington, Baltimore and Annapolis Selected to Transport Next Tuesday's Crowd," contains the following: "In selecting the route the officials were impressed with the high degree of safety with which the single-track section, between Naval Academy Junction and Annapolis, has recently been brought by the installation of the Blake signal system * * * A demonstration of the working of the Blake system on the single track convinced them that the Annapolis branch was equally as well protected against accident as the double-track portion of the road."

POWER TRANSMISSION

Preliminary surveys for the proposed dam at Copper Falls are being made, and it is possible that power from these falls will be furnished to Ashland, Wis., by next December.

The Unaka (Tenn.) Tanning Company will erect a large electric plant for industrial power. A dam will be put in and the fall of Pigeon River utilized to run the dynamos.

Power from the new plant of the Spokane and Inland at Nine Mile Dam is now being used by the railroad for its Inland division, running from Spokane, Wash., to Palouse and Colfax.

The Cascade Power Company has been organized at Brevard, Transylvania County, N. C. Stock to $125,000 has been subscribed. The incorporators are W. P. Whitmore, J. C. Hollis, J. A. Galloway and others. Electricity will be generated for lighting and commercial power purposes.

Persons in Salt Lake City, Utah, believe that the Western Power Company, a Gould corporation allied to the Western Pacific Railroad, will eventually become a powerful rival of the great power companies which have developed in the West in the past few years. One of these, the well-known Telluride company, in 14 years, from a comparatively small beginning in Provo canyon, has built up or acquired six power plants in Utah and Idaho, representing a value of several millions of dollars. According to reports the new Western Power Company is buying all land and water rights near the line of the railroad with which it is allied.

At Au Sable, Mich., the Commonwealth Power Company intends to develop on an extensive scale the waterpower of Au Sable River, generating power for manufacturing enterprises and for illuminating purposes. Bay City and other towns within a radius of 75 miles of Au Sable will be supplied from the proposed plant.

General Electric interests are reported to be behind a project to build a $2,000,000 power plant to utilize the Spearfish River at Spearfish, S. D. A few years ago a plant erected by the Spearfish Electric Light and Power Company was put out of commission by the flood of 1904, and no effort has since been made to utilize the stream for that purpose until the Black Hills Traction Company entered the field.

The Columbus (Ohio) Light, Heat and Power Company has been incorporated with a capital stock of $2,000,000 by Edwin R. Sharp, Henry S. Waite, William K. Lanman, George Hardy and Harford T. Stewart. The stock is divided in 7,500 shares of common and 12,500 shares of preferred. The new company will purchase the property of the Columbus Public Service Company and lease it to the Columbus Railway and Light Company, leaving the latter a clear field.

PUBLICATIONS

The bargain sheet for August issued by the Gregory Electric Company, Chicago, lists nearly all possible kinds of electrical apparatus, instruments and supplies, with description, quantity in stock and price.

A clear exposition of the operation of the Westinghouse Type L triple valve is given in the Westinghouse Air Brake Company's instruction pamphlet No. 5034. This book will prove valuable to those who have to use this valve. The pamphlet is substantially bound.

The H. W. Johns-Manville Company, 100 William Street, New York, has issued two circulars regarding its products which central-station men may find useful. The folders, "How to Preserve Your Gauge Glasses" and "Pointite, a Tinners' and Slaters' Roof Cement," will be sent on request.

The uses of "Fancleve" fittings for flexible armored cables are described in a bulletin sent out by the patentee and manufacturer, John L. Gleason, Jamaica Plain, Mass. Fancleve outlet boxes and plates, switch and cut-out cabinets and fittings will be found useful in work in new or old buildings.

The Central Electric Company, Chicago, is distributing data sheets on the Pittsburg high-efficiency transformers, which employ the recently developed silico-vanadium electrical steel. This steel is said to be one of the most important recent developments in transformer design and is exciting a great deal of interest among transformer users.

Bulletin No. 57 of the H. T. Paiste Company, Philadelphia, dated for August, describes some new Paiste electrical fittings, among them the new ground clamps, panel and junction boxes. The Paiste molding cross-over is the subject of "Aleck's" blackboard talk this month, and a number of molding receptacles for show windows are described and listed.

The feature of "Trumbull Cheer" for August is a story with a moral, "Wanted—$50,000," written by a sales manager of the Trumbull Electric Manufacturing Company, Plainville, Conn., publisher of the little magazine. Besides several pages taken up with displays of Trumbull electrical fittings, the inside covers are given over to humorous philosophizing.

Carse Brothers Company, 165 Broadway, New York city, have a bulletin, No. 101, illustrating and describing its line of Reliance electrically driven swing saws. These machines are of compact and rigid construction, and the saw is forced to follow its cut. The controlling apparatus is conveniently arranged so that the operator can start and stop the saw without changing his position.

An aid to quick calculation of the radiation required to heat a given room is Schott's scale, devised by W. H. Schott, central-station and industrial heating engineer, with offices in the American Trust Building, Chicago. The scale is a compact celluloid affair, arranged with a slot under which may be read directly the radiation necessary for the exposed wall, glass surface and cubical contents of the room. Adding these quantities gives the required heating surface without further calculation. The device applies to steam heating, and, through a correction factor, to systems of hot-water heating.

The Sachs Company of Hartford, Conn., which makes electrical protective devices for any voltage, has issued a catalogue of its non-arcing fuse specialties which are designed for service at from 110 to 10,000 volts and carrying one-quarter to 600 amperes. These fuses are made in a great number of sizes within the above ranges, and the cartridge types are fitted with many different styles of terminals. The catalogue is complete, with illustrations, descriptions and prices.

The General Electric Company, Schenectady, N. Y., has just issued a folder describing its mercury arc rectifier in connection with moving-picture machines. The use of the rectifier enables the operator to obtain direct current from an alternating-current circuit, thus securing the best light at low cost. This outfit forms a simple and compact piece of apparatus, requiring practically no more attention or adjustment than the ordinary rheostat, and will operate satisfactorily on any alternating-current voltage from 200 to 240, and any frequency from 40 to 140 cycles. A full description, with prices, is given in Folder No. 3681.

TELEPHONE

The Pan Telephone Company is planning the installation of an automatic service at Fort Smith, Ark.

The Hackberry Farmers' Telephone Company has been incorporated at Peek, Okla., with a capital of $5,000.

The Banner Telephone Company of Oklahoma City, Okla., has been incorporated by George I. Myers and others.

The Grant and Dallas County Telephone Company has been incorporated at Carthage, Ark., with a capital of $25,000, by R. E. Harrison and others.

Ten months ago the Bell telephone interests authorized the general sale of their standard apparatus, and in that interval the Western Electric has added to its list of customers no less than 3,600 Independent telephone companies, it is asserted.

At Peking, China, there has been installed a telephone exchange, and the lines are being extended throughout the city. The inhabitants are rapidly taking up the modern idea, and there are already nearly 2,000 subscribers to the system. As the service is only in its first stages, a healthy growth is expected.

The second link in the underground telephone cable line between Chicago and Milwaukee was opened for service between Kenosha and Milwaukee last week. From Milwaukee to Racine there now are 126 pairs of wires in operation and between Racine and Kenosha 60 pairs. The entire cable line is to be finished this fall. The cost has been over $1,000,000.

The personal-property assessment of the Chicago Telephone Company in the seven towns of Chicago has been fixed by the reviewers at $8,905,000. This is an increase over last year's assessment of $740,000, and was made at the suggestion of President B. E. Sunny of the telephone company, who explained that his company should be assessed at about that much additional to last year's figures.

The Superior Court in Seattle, Wash., held in a recent ruling that a telephone company had the right to withdraw an open-service instrument from a drug store and install a pay-service instrument. The merchant sought to compel the company to allow the open instrument to remain, setting up that the regular charges were paid for the service. The court held that it was not right to compel the company to give service to the public.

The plans of the Illinois Tunnel Company, which operates the Chicago freight tunnels, for enlarging the business of the automatic telephone exchange, whose lines occupy its tunnels, will be announced next month. No difficulty is anticipated in meeting all the terms of the ordinance. The new mortgage of the Chicago Subway Company provides for a segregation of assets that may be created under the telephone franchise. As the downtown district is wired for the automatic telephone, the campaign for subscribers will not involve the disturbance of tenants in the office buildings.

SOCIETIES AND SCHOOLS

One of the few special technical institutes of the West is located at Terre Haute, Ind. This is Rose Polytechnic Institute, under the presidency of Dr. C. L. Mees, who has maintained it at a high standard of excellence. It occupies a large and completely equipped building within the city limits, and its work is both theoretical and practical, its equipment enabling it to give its engineering students—civil, mechanical and electrical—an abundance of practical work. The reputation of Rose Polytechnic Institute is such as to give its graduates a high standing in their profession.

MISCELLANEOUS

The smelter production of copper in the United States in 1907, according to L. C. Graton, of the United States Geological Survey, was 868,996,491 pounds. From the record figures of 1906 this is a decrease of 48,809,191 pounds, or 5.6 per cent., the largest actual decrease ever recorded and the largest relative decrease since the American copper industry became important. This is the first time since 1901 that the annual production has been smaller than that of the preceding year, and the first time since 1872 that it has been smaller than that of the second year preceding.

TRADE NEWS

The J. G. Barr Electric and Heating Company, recently capitalized at $10,000 by Jesse G. Barr, A. B. Irwin and Frederick Merrill, will manufacture electric motors and equipment at 120 Randolph Street, Chicago.

Award for electric-light fixtures for the new Senate Office Building, Washington, D. C., for which bids were opened on July 25th, has been made to the Mitchell-Vance Company of New York, at its bid of $35,521 for the entire work.

Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until 3 p. m. on September 10th, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States postoffice at Kenosha, Wis. Copies of the drawings and specification may be obtained from the custodian of site at Kenosha or at the office of the supervising architect.

The demand for transformers suitable for underground installation is constantly increasing. The General Electric Company, Schenectady, N. Y., in Bulletin No. 4608, just issued, describes its improved Type H subway transformers as possessing the following essential characteristics: They are absolutely watertight, properly proportioned for the limited space in the manholes, possess high sufficiency and large radiating surfaces, and have a small temperature rise. These transformers are manufactured for a frequency of 60 cycles at standard voltages, and in capacities of from 5 to 300 kilowatts, inclusive.

Alfred H. Mulliken, president of Pettibone, Mulliken & Co., Chicago, is earnestly in favor of permitting the railroads to increase their freight rates. He says: "A 10 per cent. horizontal increase in freight rates would hardly be known by any consumer. To the railroads it would mean an increase of $140,000,000 to $150,000,000 in earnings per year. It is absolutely true that the railroads cannot prosper without helping the people. They do not hoard their earnings. Seventy per cent. of their gross earnings are spent immediately for labor and materials. Every business man, and, in fact, all men, should do all in their power to assist the railroads to obtain this advance in freight rates, and until this advance is made the railroads will not have an improved credit upon which to base expenditures, which will bring about a general revival in all lines of trade."

The purchasing agent of the Isthmian Canal Commission, Washington, D. C., is inviting proposals until August 31st for six motors, 440-volt; four motors, 2,080-volt; one electric road, 4,738 feet long; one electric road, 4,696 feet long; one spur track, 600 feet long; 30 steel motor cars; 10 hoisting motors, 500 to 550 volts; 10 bridge motors, 500 to 550 volts; 10 trolley motors, 500 to 550 volts; 20 other hoisting motors; 20 other bridge motors and 20 other trolley motors.

BUSINESS

The Central Electric Company, Chicago, is distributing revised price-lists for Raven Core rubber-covered wires and cables and also for Columbia incandescent lamps of the Gem, Gem Prismo, tungsten and tantalum types. These price-lists will be sent upon request.

Mr. H. H. Sturtevant of Zanesville, Ohio, proprietor of the largest department store in Southeastern Ohio, recently placed a contract with the Ohio Electric Railway Company for a complete installation of Westinghouse-Nernst lamps to replace electric arcs. This contract was the first order for the new Westinghouse-Nernst units to be placed in the Cincinnati territory of the Nernst Lamp Company and the first fruits of the new-business-getting campaign of the Ohio Electric Railway Company. Mr. N. C. Draper, the new manager of the Zanesville division of the Ohio Electric Railway Company, has started in with the intention of making substantial old Zanesville a modern electric city.

The Studebaker Automobile Company is much pleased with the demand for Studebaker electric pleasure cars. In cities like Cleveland, Rochester, Chicago and Denver, the visitor is surprised by the great number of these vehicles seen on the streets, many of them driven by women. The electric automobile situation is a peculiar one. For instance, in Philadelphia, where the level and well-paved streets are well adapted for the use of electrics, there are said to be less than 50 cars in operation, and it is only recently that Philadelphians have taken any interest whatever in these most convenient and economical vehicles. But once let the electric get a footing and it is surprising how rapidly its popularity spreads. The Studebaker company began to build electrics long before it took up the manufacture of gasoline cars and it has always been enthusiastic regarding this branch of the business. Recent reduction of the already low cost of maintenance, in the opinion of Hayden Eames, general manager of the Studebaker company, is largely responsible for the great increase of late in the sale of electric cars.

That the return of business activity is not confined to a few of the leading lines of industry, but covers practically all branches of production, may be seen in a list selected from orders recently taken by Allis-Chalmers Company for power generating units of the several types built in its West Allis, Milwaukee works. Among the contracts let for Corliss-engine units, which in most cases include generators and in others a full complement of exciters, transformers, motors, switchboards, etc., are machines to be installed by the Keith Car and Manufacturing Company, Sagamore, Mass.; the El Paso Foundry and Machinery Company, El Paso, Tex.; Diamond Roller Mills of the Dalles, Ore.; Corn Products Manufacturing Company, comprising units of 3,000 horsepower for the new glucose factory at Argo, Ill.; Galland Mercantile Laundry, San Francisco, Cal.; Brooksville (Ind.) Electric Company; Calhoun Mills, Calhoun Falls, S. C., and Durham (N. C.) Cotton Manufacturing Company, in the great southern textile district; Pend d'Oreille Electric Company, distributing current to the mines around Sand Poinnt, Ida.; Citizens' Electric Company, Williamsport, Pa.; Green Fuel Economizer Company, Matteawan, N. Y.; Frank H. Falls, manufacturer of plumbers' supplies, at Rochester, N. Y.; the city of Monroe, Wis.; Mayfield (Ky.) Water and Light Company; National Wood Pipe Company, Olympia, Wash.; Green Bay (Wis.) Paper and Fiber Company; Great Western Sugar Company, comprising four units for refineries at Fort Collins and Eaton, Colo., and others in industries equally diversified. Steam-turbine and generator sales include units for the Pfister & Vogel Leather Company, Milwaukee; Washburn-Crosby Mills, Minneapolis; the Pueblo and Suburban Traction and Lighting Company, Pueblo, Colo.; the municipal light plant of the city of Holland, Mich., the Winona Interurban Railway Company, Warsaw, Ind., and A. F. Gallun & Sons, leather manufacturers, of Milwaukee. Hydro-electric units ordered comprise three turbines, having a combined capacity of 10,800 horsepower, for the "Olmsted" plant of the Telluride Power Company of Provo, Utah, four of 2,350 horsepower for the Sioux Falls (S. D.) Light, Heat and Power Company; one of 1,700 horsepower, with 150-horsepower exciter turbine, for the Wausau Street Railway Company, Wausau, Wis.; one of 450 horsepower for the Andrews Light and Power Company, Salmon, Ida., and a 1,150-hosepower turbine for the Holton Power Company, Holtville, Cal. Negotiations for the gas-engine-driven electrical units have also become very active of late, and, in addition to the orders taken for steel-mill and traction service, aggregating 107,400 horsepower, Allis-Chalmers Company has closed a contract with the Southwestern States Portland Cement Company for two horizontal tandem gas engines rated at 2,000 horsepower, to be installed in the new mill at Eagle Ford, Tex. Taken, therefore, in connection with the orders for motors, transformers and other standard types of auxiliary electrical apparatus, reported by Allis-Chalmers Company, the business outlook becomes more promising from one week to another.

DATES AHEAD

Michigan Electric Association (annual meeting), Grand Rapids, Mich., August 18th to 21st.

International Association of Municipal Electricians (annual convention), Detroit, Mich., August 19th, 20th, 21st.

Ohio Electric Light Association (annual convention), Hotel Victory, Put-in-Bay Island, August 25th, 26th and 27th.

Old Time Telegraphers' Association and Society of the United States Military Telegraph Corps (annual reunion), Cataract-International Hotel, September 16th to 18th.

Colorado Electric Light, Power and Railway Association (annual convention), Glenwood Springs, Colo., September 16th, 17th and 18th.

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

Chicago Electrical Show (fourth annual), Coliseum, January 11 to 23, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) August 4, 1908

894,818. Electrode for the Evolution of Ozone from Oxygen or Atmospheric Air. John R. Craig, Jr., Glasgow, Scotland. Application filed April 6, 1908.

Between pairs of saw-toothed discharging electrodes is a dielectric plate, arranged edgewise.

894,820. Telegraphy. Patrick B. Delany, South Orange, N. J. Application filed May 23, 1907.

An automatic dot-maker has its elastic vibrator released and set into motion by a control magnet whose circuit is completed when the armature lever of a polarized relay is in its open position.

894,826. Multiple-cluster Socket. Charles D. Gervin, New York, N. Y., assignor to John H. Dale, New York, N. Y. Application filed July 16, 1907.

Details of construction for supporting the individual sockets are given.

894,835. Incubator Alarm. Rebecca Johnson, Maxwell, Iowa. Application filed February 20, 1907.

An alarm-bell circuit is closed by the movement of the thermostat parts.

894,836. Receiving Telegraphic and Telephonic Impulses Simultaneously. Isidor Kitsee, Philadelphia, Pa., assignor of one-half to William J. Latta, Philadelphia, Pa. Application filed June 21, 1906.

From the circuit given, the telegraph relay is shunted by a path containing four condensers in series with the primary of a repeating coil, two condensers being arranged on each side of the coil winding. The secondary winding is connected directly to a telephone receiver.

894,844. Ground Wire Clamp. Kempster B. Miller, Chicago, Ill., assignor to the Steel Gain Manufacturing Company, Chicago, Ill. Application filed July 6, 1907.

A plate on which is mounted a screw for binding the wire has four holes at the corners. A U-shaped wire is provided to pass through two of the holes, hind around the ground-pipe or rod and thread the remaining holes, being carried around projecting corner lugs and twisted up.

894,866. Dry Battery. George M. Wheeler and Henry Wilhelm, Brooklyn, N. Y. Application filed October 12, 1907.

The cell is made up of a number of sheets, one of which is of zinc, rolled into a tube. One of the sheets is folded to close the end of the tube.

894,878. Variable-speed Transmission. Henry H. Cutler, Milwaukee, Wis., assignor to the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Application filed January 5, 1906.

The transmission system is capable of several speed ratios and an electrically controlled mechanism is arranged to transfer the gears from a high to a low speed ratio in case of excess load. The clutches are electrically actuated.

894,886. Automatic Cut-out for Indicating Means. Albert B. Herrick, Ridgewood, N. J. Application filed May 21, 1904.

In case of excess current through the instrument circuit the latter is opened and an alarm circuit is closed.

894,910. Automatic Magnetic Circuit-breaker. William M. Scott, Philadelphia, Pa. Application filed May 28, 1904. Renewed March 26, 1907.

The core is normally connected through a clutch to a retarding device which comprises a dash-pot arrangement containing a frictional liquid.

894,931. Trolley Car for Electric-motor Vehicles. Riccardo Arno and Luigi Negro, Turin, Italy. Application filed June 14, 1906.

Between the motor and the wheels is interposed an electromagnetic clutch so that the motor may be operated independently of the motion of the car.

894,944. Induction-current Generator. Martin Fischer, Zurich, Switzerland, assignor to the firm of Actiengesellschaft "Magneta" (Electrische Uhren Ohne Batterie & Ohne Contacte), Zurich, Switzerland. Application filed November 20, 1903.

In the field of a horseshoe magnet having two pairs of poles an iron armature is pivoted so as to be oscillated. The core is surrounded by a stationary coil which delivers the current.

894,945. Magnetic Inductor. Martin Fischer, Zurich, Switzerland. Application filed September 26, 1904.

A stationary coil is arranged between the poles of a horseshoe magnet and within this is a movable core having a pair of extensions at each end passing over the ends of the coil and along its sides.

894,950. Dynamo-electric Machine. William T. Hensley, Wilkinsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, Pittsburg, Pa. Application filed October 18, 1907.

The commutator bar is made with a groove on one side near its inner end, which terminates in the contact edge of the bar and forms a projection, over which fits the looped extremity of a connecting strip.

894,951. Commutator. William T. Hensley, Wilkinsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company. Application filed October 18, 1907.

A recess is made near one end of the bar, into which a punched strip fits. A hole extends from the bottom of the recess to the other side of the bar and the strip or "riser" carries a projection to engage the hole.

894,952. Rail Bond. Albert B. Herrick, Cleveland, Ohio, assignor to the Electric Railway Improvement Company, Cleveland, Ohio. Application filed November 25, 1904. Renewed October 9, 1907.

Sheets of cementing material are attached to the terminal portions of the conducting element. The sheets are provided with indentations alternately arranged to form protuberances projecting from their opposite sides.

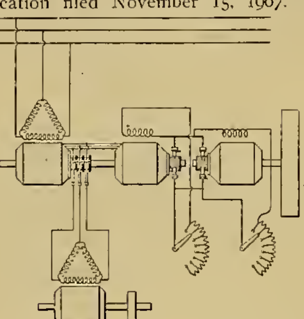
894,954. Gas-range Lighter. Peter A. Johansen, Omaha, Neb. Application filed December 6, 1907.

A gear connection with the gas valve operates an electric gas lighter, arranged with battery and kick coil, igniting a pilot flame which communicates to the main range burners.

894,964. Electric Railway. Joseph Mayer, Rutherford, N. J. Application filed September 13, 1907.

A sliding bow is pivotally connected with arms which are supported by two diamond frames, one above the other.

894,979. Load Equalizer for Electric Circuits. John S. Peck, Manchester, England, assignor to the receivers of the Westinghouse Electric and Manufacturing Company, East Pittsburg, Pa. Application filed November 15, 1907.



No. 894,979.—LOAD EQUALIZER

A rotary converter has two mechanically and electrically connected rotors and independent stator windings, one of which is connected to the circuit to be regulated. A dynamo-electric machine is electrically connected to one of the members of the rotary and provided with a flywheel, and an induction motor has its stator winding connected to the rotor windings of the rotary converter. (See cut).

895,006. Mechanism for Recovering, Transforming and Conserving Energy. Léon Dion, Wilkesbarre, Pa., assignor to the Americus Electrobermetic Company, Wilkesbarre, Pa. Application filed May 8, 1906.

The invention thoughtfully provides that water motors driving electrical generators shall be inserted in the pipes leading to each water-receiving receptacle in a dwelling. These generators are supposed to charge a storage battery, switches being supplied at each faucet or valve so that the battery may not discharge itself when the generators are not running.

895,012. Motor-controlling Device. Fletcher D. Hallock, Wilkinsburg, Pa., assignor to the receivers of the Westinghouse Electric and Manufacturing Company, East Pittsburg, Pa. Application filed November 8, 1907.

An electromagnetically controlled shunt prevents the speed-regulating field resistance from becoming operative until certain armature conditions have been established.

895,030. Spark Plug. James Lang, Cavalier, N. D. Application filed November 25, 1907.

Details of the insulating construction of the sparkplug are described.

895,034. Attachment for Photographic-printing Apparatus. Hervey H. McIntire, South Bend, Ind. Application filed September 11, 1903.

Inside the case incandescent lamps are arranged on support rods, transfixing ball-and-socket joints so that the lamps may be placed in any desired position in relation to the printing surface.

895,035. Electric-railroad Signal. Arthur W. McMaugh and Robert Welch, St. Catherines, Ontario, Canada. Application filed December 3, 1906.

A third rail is laid in sections in the center of the track and engages the contact spring carried on the car. The circuit, completed through the mechanical rails, operates an alarm bell.

895,044. Method and Apparatus for Controlling Electric Circuits. Otto Rothenstein, Chicago, Ill. Application filed November 1, 1906.

The method employed is that of directing a stream of conducting liquid through an inert insulating fluid toward another fixed terminal also submerged, for the purpose of closing the circuit, suppressing the stream of conducting liquid to interrupt the circuit, and varying the period of time during which the conducting stream lasts or ceases, to control the current impulses.

895,070. Trolley-pole Mount. Edwin H. Burnes, Amsterdam, N. Y., assignor of one-third to Phœbus H. Alexander, Amsterdam, N. Y. Application filed July 27, 1904.

The construction provides a large base and leaf springs to retract the trolley pole through a lever rigging.

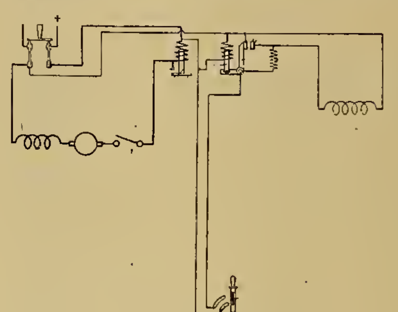
895,087. Machine for Opening Letters. Marie Heilbron and Jerome W. Walker, New York, N. Y. Application filed November 11, 1907.

The rotary oblique cutting roller to which the edges of the envelopes are exposed is belted to an electric motor.

895,100. Alternating-current Meter. Emanuel Morck, Charlottenburg, Germany. Application filed December 5, 1903.

The main current coil is mounted on a frame having two magnetic branches, one with an adjustable air space. A potential coil is mounted on a similar frame. A suitable armature cuts the magnetic field of the main current coil in its adjustable air space and of the potential coil in the constant air space.

895,135. Controlling System for Lifting Magnets. Reuben I. Wright, Cleveland, Ohio, assignor to the Electric Controller and Supply Company, Cleveland, Ohio. Application filed April 10, 1908.



No. 895,135.—LIFTING MAGNET

The lifting magnet winding is in parallel with the motor circuit. Resistance is inserted in series with the winding by the automatic operation of relays. (See cut.)

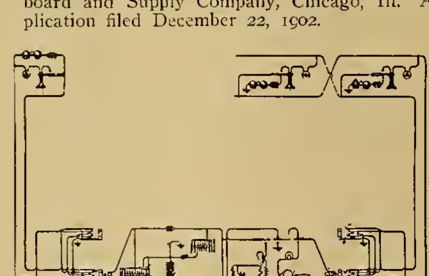
895,144. Application of Electrolysis to Scouring and Squeezing Machines. Jena M. J. Baudot, Roubaix, France. Application filed March 28, 1905.

This process of washing fabrics free of soap consists in guiding the material through a trough containing a solution of an alkaline carbonate and a pair of electrodes, the cloth traversing a path between the electrodes. The fabric is finally squeezed to expel the electrolytic products.

895,163. Electro-deposition of Copper. Sherard O. Cowper-Coles, London, England. Application filed May 20, 1907.

The copper is deposited on a cone-shaped cathode, rotating at a rate of 1,500 or more revolutions per minute in an electrolyte composed of 12.5 per cent. of copper sulphate and 13 per cent. of sulphuric acid. The current density at the cathode is specified at 200 amperes per square foot of surface.

895,166. Telephone System. William W. Dean, Chicago, Ill., assignor to the Kellogg Switchboard and Supply Company, Chicago, Ill. Application filed December 22, 1902.



No. 895,166.—TELEPHONE SYSTEM

The supervisory signal on the answering end of the cord remains visible during conversation. (See cut.)

895,171. Cable Hanger. John D. E. Duncan, East Orange, N. J. Application filed November 29, 1907.

The hanger body is fitted with both hook and clamp to grip the cable.

895,175. Appliance for Wiring Conduits. Philip H. Fielding, New York, N. Y. Application filed June 6, 1906.

A block is made of suitable size to fit into the cutaway section of a conduit pipe and is provided with metal screws to make contact with the wires.

895,199. Apparatus for Releasing Horses. Charles C. Rich, Mount Vernon, N. Y., assignor of one-half to Harry J. Douglas, Mount Vernon, N. Y. Application filed July 12, 1907.

An electromagnetic latch is described.

895,225. Spark-plug. Willis L. Ash, Lansing, Mich. Application filed October 11, 1905.

The method of construction is described in detail.

895,242. Electromechanical Movement. George H. Davis, West Orange, N. J. Application filed July 11, 1907.

The armature which plays in front of the pole pieces of a horseshoe electromagnet is made up of articulated sections, some of which are in contact with the magnet poles.

895,251. Trolley Catcher. George Gessert, Edwardsville, Ill. Application filed March 16, 1908.

Journaled in the harp and extending above the trolley wheel are two spring-mounted beveled wheels which may rotate in contact with the trolley and, though normally closed, may be pushed apart by the pressure of the trolley wire entering the groove.

895,314. Automatic Collapsing and Re-erecting Trolley Pole. George S. Thomson, Dunedin, New Zealand. Application filed November 29, 1907.

A tripping device which permits the collapse of the pole is actuated by the swinging movements of the pole when it passes a certain predetermined angular position.

895,321. Trolley Guard. Charles H. Yarrington, Waterbury, Conn. Application filed December 17, 1907.

Guard fingers extend upward and are normally spaced apart a distance less than the width of the groove in the wheel and slightly greater than the diameter of the trolley wire. Spring connections hold the fingers normally in position.

895,339. Trolley. Leon W. Campbell, Woonsocket, R. I. Application filed January 4, 1907.

An anti-friction bearing is interposed between the trolley and the arbor. Washers on the arbor bear against the end walls of a cavity in the wheel to conduct the current from the trolley to the arbor.

895,345. Electric Switch. James T. Cooper, Cassville, Mo. Application filed July 23, 1907.

Apparently intended for outside installation on a crossarm, the switch is operated by a bell-crank lever attached to a string, lifting the hook contact out of its engaging eye.

895,350. Multiplex-telegraph System. Amor W. Douglas, Albuquerque, New Mexico. Application filed April 13, 1907.

The multiplex telegraph system is built up of the following: An alternating-current circuit, a transformer connecting the circuit with the line wire, a grounded wire, including resistance and capacity, a local circuit, including a battery, means for opening and closing the local circuit, and devices thereby controlled for opening and closing the alternating-current circuit and also the grounded conductor.

895,374. Means for Perforating Slips for Telegraphic Signaling and Other Purposes. Maximillian Kotyra, Paris, France. Application filed December 3, 1906.

Three punches are operated by three electromagnets controlled by keys. Each key when depressed brings into operation the appropriate combination of electromagnetic devices to operate the combination of punches corresponding.

895,378. Reversible and Collapsible Trolley Pole for Electric Vehicles. John Lindsay and Robert Lindsay, Dunedin, New Zealand. Application filed November 6, 1907.

The pole is in two sections, the upper extension being pivoted and under pressure of a spring at the extremity of the pole proper. When the pole leaves its inclined operative position the spring is released.

895,400. Motor-control System. Charles D. Gilpin, Cleveland, Ohio, assignor to the Electric Controller and Supply Company, Cleveland, Ohio. Application filed April 10, 1908.

Automatic acceleration switches control resistance sections. A reversing switch is arranged to connect the armature in a dynamic breaking circuit in one position.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired August 11, 1908:

457,334. Pole Trolley and Stand for Electric Street Railways. T. E. Adams, Cleveland, Ohio.
457,338. Electrical Switch. H. H. Blades, Detroit, Mich.
457,358. Brush Holder for Dynamo-electric Machines or Motors. C. O. Mailloux, New York, N. Y.
457,362. Electric Steam Generator and Heater. W. Mitchell, Malden, Mass.
457,374. Safety Device for Electric Wires. J. H. Sedlmeyer, Johnstown, Pa.
457,382. Electric Railway. M. H. Smith, Halifax, England.
457,407. Self-regulating Electric Converter. T. Spencer, Pittsburg, Pa.
457,430. Electric Battery. F. Poudroux, Paris, France.
457,453. Electric Meter. E. Meylan and W. C. Rechniewski, Paris, France.
457,454. Annunciator. W. R. McCann and S. S. Creider, Sterling, Ill.
457,457. Electric Oil-well Heater. C. W. Robinson and S. D. Robinson, Allegheny, Pa.
457,477. Automatic Telephone System. H. V. Hayes, Cambridge, and H. D. Sears, Lynn, Mass.
457,483. Automatic Electric-circuit Switch. W. L. Silvey, Lima, Ohio.
457,555. Electrode for Secondary Batteries. L. Paget, New York, N. Y.
457,572. Switch. S. Bergmann, New York, N. Y.
457,657. Wind Apparatus for Generating Electricity and Charging Secondary Batteries. J. M. Mitchell, Lawrenceville, Ga.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, AUGUST 22, 1908 No. 8

HYDRO-ELECTRIC DEVELOPMENT IN NORTHERN SPAIN

By Dr. Alfred Gradenwitz

The industrial city of Bilbao, situated in Northern Spain, on the Bay of Biscay, and which is especially well known for its iron mines, possessed some electrical works before 1901, located partly in the city and partly in its immediate neighborhood, and from which the current, generated by steam-driven units, was supplied nearly exclusively for lighting purposes, owing to the high price of fuel.

In order to comply with the urgent want of cheap electric power, a company called the Sociedad Hidroeléctrica Ibérica was founded in 1901 for exploiting at the start, the energy of three waterpowers located at about 70 kilometers from Bilbao.

The names and outputs of the three power houses eventually erected, the relative situation of which will be seen from Fig. 5 (page 130), are as follows:

(1) Leizaran power station........4,000 horsepower
(2) Quintana power station.......4,000 horsepower
(3) Puentelarra power station.....8,000 horsepower

The electrical equipment of all of these plants was supplied by the Siemens-Schuckert Works of Berlin and the turbines and accessories by Escher, Wyss & Co. of Zurich.

The Leizaran power house (Fig. 3), situated in the neighborhood of the San Sebastian health resort, utilizes the power of the River Leizaran, which rises in the Pyrenees. Four Pelton wheels of 1,000 horsepower each, rotating at 375 revolutions per minute, with service-motor governors actuated immediately by the pressure water, are used to operate the generators. Three smaller Pelton wheels of 50 horsepower each, turning at 500 revolutions per minute, serve for actuating the exciters.

The polyphase generators, which are directly connected to the large turbines through elastic clutches, develop an output of 863 kilovolt-amperes each, at a pressure of 3,000 to 3,300 volts, a special feature being that both the base-plate fitted into the engine-house floor and the stator housing are made of wrought-iron, resulting in a considerable saving of freight and customs expenses. Fig. 2 shows one of these generators.

For the low-tension (3,000-3,300 volts) the switch gear is located in two self-contained compartments. One of these is a compartment located at the level of the engine-house floor, and in it all the measuring transformers (for current intensities and pressures) directly connected to the 3,000-volt system, together with self-acting maximum switches with time relays, switch-outs, etc., are mounted. The second compartment, situated above the first, contains on a switchboard of considerable size (Fig. 6) the measuring instruments for the exciter dynamos, transformers and transmission lines, while the measuring and controlling apparatus of the polyphase-current generators are placed on a smaller board. From this compartment a complete view of the engine house may be obtained through a wide opening in the wall and a projecting platform. The switchboard attendant is stationed in front of the smaller switchboard, from which any manipulations required for controlling the service, such as the connection in parallel of generator units, regulation of potential, distribution of load through the remote control of the turbine governors, etc., may be effected.

Transformers raise the potential of 3,000-3,300 volts, at which the current is generated, to 33,000 volts for long-distance transmission. According to the size and number of the generators, four sets of star-connected transformers—that is, an aggregate of 12 units of 285 kilovolt-amperes each—have been installed. Above the transformer room is situated the high-tension (33,000-volt) switching room, which, in normal operation, need not be entered by the staff. This room (Fig. 7) contains in masonry cells the oil switches for the transformers and transmission lines, which are actuated through rope transmission from the large switchboard represented in Fig. 6, as well as disconnecting switches with ground contacts and current and potential transformers for the power-transmission line.

The 12 oil switches, as shown, are contained in separate vessels, connected for the sake of operation by insulated rods, and comprise for the transformers four breaks and for the transmission lines eight breaks immersed in oil, and which are connected in series.

In another closed room are placed other safety devices, including choke coils and a number of horn lightning arresters arranged in parallel. One of the arresters is connected to the ground through a wide spark gap (for each wire), while the others are branched off through shorter spark gaps in front, at the back and from the choke coils, respectively. This arrangement has given very satisfactory protection from the frequent high-potential surges occurring in the operation of plants of this kind.

The Quintana power station, situated in the neighborhood of the railroad station of Miranda de Ebro, on the Irun-Madrid Railroad, utilizes, with the aid of a channel 10.6 kilometers long, the waterpower of the River Ebro. Horizontal-shaft Francis spiral turbines are used. At 375 revolutions per minute they give an effective output of 1,000 horsepower each. In order to afford an adequate protection against the high water of the Ebro, which is frequently rather considerable, the power house had to be placed at so high a level as to give the suction tubes dipping into the lower pond a

Fig. 1. Interior of Puentelarra Power Station
Fig. 2. Polyphase Generator Coupled to Waterwheel at Leizaran Station
Fig. 3. Leizaran Hydro-electric Station on River Rising in the Pyrenees
Fig. 4. Canal Leading to Puentelarra Power Station on the Banks of the Ebro
HYDRO-ELECTRIC DEVELOPMENT IN NORTHERN SPAIN

length of seven meters from the turbine axle to the lower pond level. The polyphase-current generators are directly coupled to the turbines, and the exciter dynamos and the whole of the switching and transformer plant are exactly like those of the Leizaran central station.

Situated 22 kilometers downstream from the Quintana plant, the Puentelarra station utilizes another waterpower of the Ebro, which in the meantime has combined with some smaller tributaries. The Puentelarra power house, therefore, has at its disposal a far greater amount of water than the Quintana station, and this fact, in summer, during the well-known scarcity of water of most Spanish rivers, is bound to prove of special importance.

The canal for the Puentelarra plant, 15.8 kilometers in length, was a costly and difficult construction, penetrating suddenly into a narrow valley of the Ebro, formed by high mountain slopes, after traversing a practically level ground through a distance of about five kilometers. On the rocky slopes some very laborious blasting work was required to obtain a horizontal support about seven meters in width for the canal or conduits, which at many places had to be secured by walls. Fourteen tunnels, 6.2 meters in width and four meters in height, with a total length of 800 meters, were further required to penetrate through the numerous rocky walls projecting at right angles to the mountain slope. A view of the canal in the valley of the Ebro River is given in Fig. 4.

The main difference in the mechanical and electrical equipment of this power station from those above described is that each of the generator and transformer units is designed for an output twice as great, viz., 2,000 horsepower.

The turbines, which are directly coupled to the dynamos (Fig. 1), are worked at a speed of 300 revolutions per minute. The switch gear is arranged quite similarly to those of the other two central stations. The main switchboard comprises any apparatus required for the exciter dynamos, transformers and long-distance transmission lines. Four columns, located on the right, carry hand levers for the remote operation of the transformer low-tension switches, and the levers fixed on the six left-hand columns correspond to the two high-tension switches of the transformers and two transmission lines.

The potential of all the transmission lines is 30,000 to 33,000 volts, with 50 cycles per second. This figure, at the time when the erection of this extensive plant was planned, was considered the highest voltage compatible with perfect safety of operation, and, in fact, these lines were the first European power-transmission lines operated at so high a tension. The aggregate length of the transmission lines is about 350 kilometers.

As the greater part of the energy generated at the three generating stations is used either at the city of Bilbao or in its immediate neighborhood, the city was found to be the most convenient location for a main distributing station, in which the incoming current of 30,000 volts might be transformed to the general consumption voltage of 3,000 volts. The high-tension lines arriving at this sub-station are carried over safeguards and switches and are combined on the self-contained bus-bars of each transformer station, in order thence to be taken to the transformers.

Fig. 6. Main Switchboard at Leizaran Generating Station

Fig. 7. High-tension (33,000-volt) Switching Apparatus at Leizaran Station

HYDRO-ELECTRIC DEVELOPMENT IN NORTHERN SPAIN

The ground floor of the Bilbao station at present comprises, arranged in eight sets, 24 single-phase oil transformers of 285 kilovolt-amperes each, for a ratio of 30,000 to 3,000 volts, of accurately the same design and output as those of the Leizaran and Quintana power stations. Room is, however, provided for the same number of additional units.

The transformer switch gear is located above this compartment. The aggregate current of the transformers is taken from three systems of copper bars, corresponding to the three generating stations, to the large distribution switchboards installed in the adjoining room. Each of these switchboards comprises apparatus intended for consumers, viz., 3,000-volt oil switches with time relays, disconnecting switches with ground connections, ammeters and wattmeters. A large number of feeders start from each of these distribution switchboards to the premises of customers.

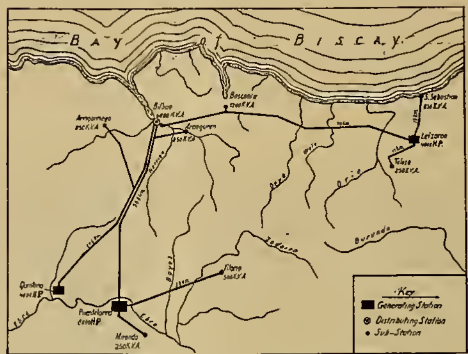


FIG. 5. MAP SHOWING HYDRO-ELECTRIC DEVELOPMENT IN NORTHERN SPAIN

WIRING METHODS IN ST. PAUL

A recent survey of electrical construction in St. Paul, Minn., by an insurance inspector showed that in the business section wires are mainly underground, except that in a number of instances low-tension signal wires are carried over roofs. Outside of the business section, wires are part overhead and part underground. The distribution for light and power work is mostly underground, except that in a number of cases a single connection from the underground system is run overhead through several basements. The distribution for low-tension signal work is principally from poles in block interiors.

Overhead-trolley wires, with ground return, are on a number of streets in the business section. For overhead work, light and power wires have triple-braided, weatherproof insulation and are carried on poles about 125 feet apart. Transformers are oil-cooled and located on poles, except in seven cases, where they are inside buildings in fireproof vaults. Secondaries of transformers and the neutral of the three-wire system are grounded. All overhead light and power circuits are protected against lightning by choke coils and arresters placed along the lines. Low-tension or signaling circuits are protected with one-half to eight-ampere fuses, and lightning arresters placed at central office or subscriber's end, or both, and at the junction of all overhead and underground work.

The traction company has considerable return feeder in and contiguous to the center of the city, terminating in the sub-station. There are a number of long street-car lines to the outlying districts, with heavy traffic, depending entirely upon the rails for the return circuits. Seventy-five per cent. of the system is bonded with flexible compression bonds and the remainder is cast-welded. Cross-bonds are provided every 500 feet.

ELECTRIC SERVICE ON THE ISTHMUS

The electric-light and power system of the Canal Zone supplies light to practically every settlement between Colon and Panama, excepting a few hamlets in the territory north of Gorgona, and the villages of Miraflores and Gatun, reports the Canal Record, the official journal of the Isthmian Canal Commission. A temporary plant is being installed at Gatun. Twenty-four thousand lights are in use, and power is furnished for various purposes. The power plants are located at La Boca, Empire, Gorgona, Gatun and Cristobal.

At the close of the year 1905 the only commission buildings electrically lighted were the hospital, the Administration Building and quarters at Ancon and the hospital, Administration Building and quarters at Colon and Cristobal. The Panama Railroad Company at that time was maintaining a small electric plant at La Boca, which consisted of a 125-kilowatt, 220-volt, direct-current generator supplying power for the operation of the electric cranes on the docks, and a 60-kilowatt, two-phase, 2,200-volt alternating-current generator supplying lights in the commission buildings and on the railroad docks. In Colon the Panama Railroad Company's electric plant consisted of two 60-kilowatt, 125-cycle, 2,300-volt, single-phase, belted-type generators, supplying lights to Panama Railroad and Canal Commission buildings in and about Colon and Cristobal.

When it was decided to move the engineering headquarters from Panama to Culebra, and the auditing and disbursing offices to Empire, the purchase of two 100-kilowatt machines and sufficient wiring material for the installation of 3,000 lights for these two towns was authorized. The generators were ordered in the spring of 1906, and were received on the Isthmus and installed at Empire late in the fall of the same year. Owing to the rapid growth of Culebra and Empire, some 3,500 lamps were ready for the current before these generators were received. The plant was put in operation January 1, 1907.

In the early spring of 1907 the purchase of an additional 200-kilowatt generator for the Empire plant was directed in order that current might be furnished from that plant to light the towns of Las Cascadas and Paraiso. This year the service of the Empire plant was extended to include Pedro Miguel, Camp Elliott and Bas Obispo, thus making the territory supplied from this center about 10 miles long. The equipment consists of one 200-kilowatt, 2,300-volt, 60-cycle General Electric generator, direct-connected to a Harrisburg tandem-compound, four-valve engine, and two 100-kilowatt, 2,300-volt, 60-cycle General Electric generators, direct-connected to horizontal tandem-compound Ball engines. This plant serves about 11,000 incandescent lights and 81 arc lamps, in addition to furnishing 309 horsepower for shop motors. Authority has been granted for the purchase of an additional 400-kilowatt unit for the Empire plant, which will arrive on the Isthmus the first week in September. At the present time this plant is being run about 30 per cent. overload during the "peak hours," from 6 to 10 p. m.

The American settlements at La Boca and Ancon grew so rapidly that by the opening of the year 1907 the plant of the Panama Railroad Company at La Boca had become quite inadequate to supply the demand for lights. A new plant was built and began supplying current in September, 1907. On July 1, 1908, this plant was turned over to the Isthmian Canal Commission, and the territory served by it was extended to include Corozal. The equipment consists of five 125-horsepower vertical-type Manning boilers; one 300-kilowatt, 250-volt, direct-current generator, direct-connected to a Westinghouse vertical compound engine; one 125-kilowatt, 250-volt, direct-current generator, direct-connected to a Westinghouse vertical compound engine; one 200-kilowatt, two-phase, 2,200-volt, 60-cycle generator, direct-connected to a Westinghouse compound engine; one 60-kilowatt, two-phase, 2,200-volt, 60-cycle generator, direct-connected to a Westinghouse compound engine; one 1,000-horsepower condensing apparatus. From this plant there are at present being operated about 5,000 lights and 19 electric cranes of about 1,500-horsepower motor capacity.

In 1906 a 100-kilowatt generator was installed at Gorgona, and lights for the shops and other commission buildings are supplied by it. An additional 100-kilowatt unit has been authorized for this plant. The present equipment consists of two 100-kilowatt, direct-current, 220-125-volt generators, direct-connected to horizontal tandem-compound Ball engines. This plant is at present serving some 3,000 incandescent lights and 71 arc lamps.

The Panama Railroad Company is preparing to move the two 60-kilowatt generators mentioned above from the lighting plant on the beach at Colon to the cold-storage plant, in order that the ground occupied on the beach may be used for dwellings. After this change the cold-storage plant will be equipped with two 60-kilowatt, 125-cycle, 2,300-volt single-phase, belted-type generators and two 100-kilowatt, direct-current, 125-volt generators, direct-connected to horizontal tandem-compound Ideal engines. This plant will supply about 4,000 lights in Cristobal and Colon, and electric power for the motors driving all machinery in the cold-storage and allied plants.

A 50-kilowatt generator, direct-connected to a simple horizontal Buffalo Forge Company's engine, has been installed and will be operating this month at Gatun, supplying about 1,000 lights. The installation at Gatun, as well as the installation of the alternating-current generators in the cold-storage plant at Cristobal, is for temporary purposes only, as it is anticipated that all lights in Gatun, Cristobal and Colon will eventually be operated from the material-handling plant at Gatun.

STEINMETZ'S ARRANGEMENT OF ELECTRIC ARCS FOR MAKING NITROUS COMPOUNDS

To attain the maximum production of nitrous compounds from the atmosphere by the expenditure of a given amount of power, the effort has been to expose the air to arcs of maximum length and minimum volume. It was to secure this result that the Bradley-Lovejoy method, which was for a time exploited on a commercial scale at Niagara Falls, drew out the arcs between stationary and rotating platinum-pointed electrodes. Direct current at a potential of about 10,000 volts was used and an inductance inserted in the circuit arrested the formation of the arc while the gap was short and, by the power so absorbed, assisted the flame at its maximum dimension.

In the method of Bradley-Lovejoy a great number of these electrodes were mounted on a shaft and rotated in a cylindrical chamber with inwardly disposed stationary electrodes. As the movable arcing points swept by, the potential bridged the short gap and the flame hung on until the electrodes were separated a dozen or more inches. In this way several thousand arcs an hour were produced in the burning chamber.

It is upon a burning-chamber process similar in principle to the Bradley-Lovejoy construction, but employing alternating current, that a patent was recently granted to Dr. C. P. Steinmetz, who has succeeded in avoiding the use of separate arc circuits or the need of individual reaction coils in each branch of the main circuit. Since an arc of such small volume as is required for the efficient working of such a process represents only very little energy and cannot be continuously maintained in a reliable manner, it is necessary to employ a large number of arcs simultaneously, which, when established, are of short length and are then drawn out to their maximum length until they break, and this process is repeated in rapid and continuous succession. The air which is subjected to the action of the arcs is driven past the arcs in a continuous stream, thus removing the nitrous compounds which have been formed as rapidly as possible from the further action of the arcs, so that the dissociation of the compounds is prevented so far as possible.

Heretofore it has been deemed necessary to establish each of the numerous arcs either in an independent circuit or in a separate branch of a main circuit, and in either case, the expense of the apparatus was great and the complexity considerable. The potential of the arc circuit is necessarily high, since the longest possible arc is aimed at, and since, for mechanical reasons, the arc must be established without actual initial physical contact of the electrodes. For independent arc circuits, therefore, it was necessary to have either a high-potential generator with a great number of independent generating coils, or a low-potential generator with many independent generating coils and in addition thereto as many independent step-up transformers. In either case, the apparatus was expensive and complex.

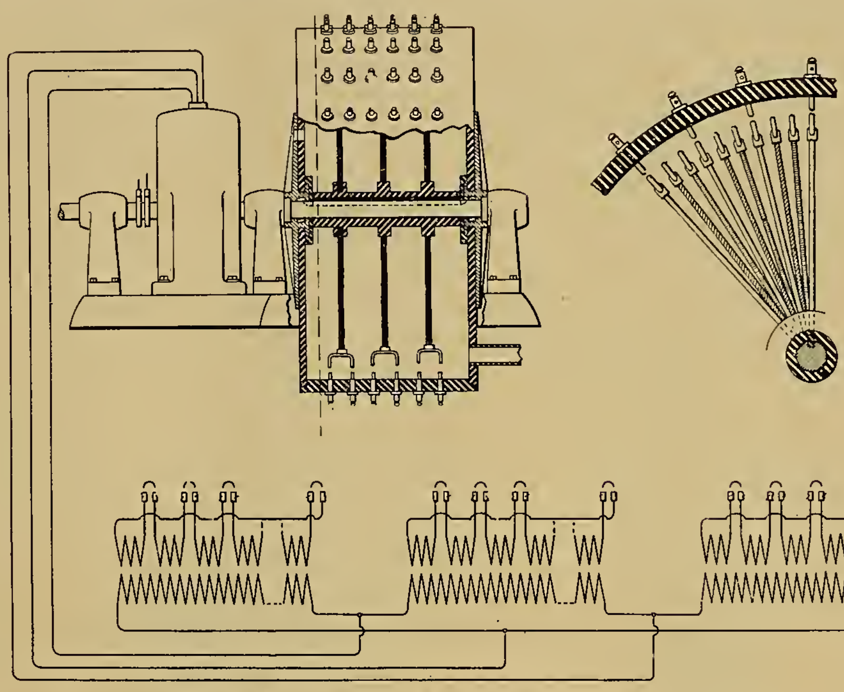
When the arcs were placed in multiple branches of a high-potential main circuit it was necessary to equip each branch with a reaction coil in order to prevent one arc from short-circuiting all the others; for one arc will always form before the others, and the resistance of the branch in which the arc is first formed will at once be lowered below the resistance of the other branches, and will thus short-circuit the latter. Reaction coils in the several branch circuits largely prevent this short-circuiting, but these reaction coils are nearly, if not quite, as expensive as independent transformers.

Dr. Steinmetz's invention involves the use of an ordinary three-phase generator of medium potential, direct-connected to the shaft carrying the rotating electrodes in the burning-chamber. A single three-phase step-up transformer has the independent secondary windings for each phase divided in open sections, which are closed upon each other by two arcs for each section, so that all of the arcs fed by one phase are in series. A diagram of this arrangement is shown in the accompanying drawing. When these arcs are broken, the arcs fed by the next phase of current are established, and these are in turn replaced by the arcs fed by the third phase. In this way an ordinary three-phase generator and a single three-phase, slightly modified transformer take the place of the complicated apparatus formerly used. The arc-establishing device, shown in the upper right-hand corner of the illustration, is as here drawn, modified to provide for the condition that each phase of current shall feed a separate group or set of numerous arcs in series.

The length of the radial arms, the size of the staples and the length of the pins which constitute the terminals are so chosen that actual contact between the staples and the terminals is not made, but that an arc passing from terminal to staple and from staple to terminal may close the series connection between the sections of each independent secondary coil. The air gaps in the secondary circuits are, therefore, in the operation of the apparatus bridged by electric arcs.

The radial arms of each order are spaced 15 degrees apart, but the arms of any order are shifted with reference to those of the preceding order by five degrees.

In the example here given there will, for each complete rotation of the shaft, be formed, lengthened and broken 3,456 arcs.



ARRANGEMENT OF ARCS FOR MAKING NITROUS COMPOUNDS

SLIDING-SCALE SALARY FOR ENGINEER

The unusual method of remunerating an engineer of an electrical undertaking by results has been adopted at Maidstone, in Kent, England. When the total works cost per unit, i. e., excluding capital charges, shall be 1⅛ pence, the salary of the engineer in charge is to be £300 per annum, and for each £100 saved to the Council through the reduction in the cost per unit sold a bonus of 20 per cent. per annum is to be paid. "One hardly knows," says the London correspondent of the Western Electrician, "whether to regard it as a sporting offer by the engineer or as an indication of the existence of a large margin for reducing the costs."

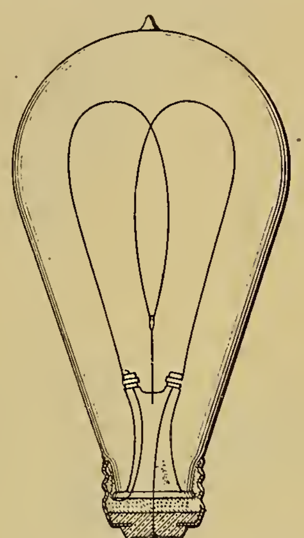
"General Lectures on Electrical Engineering" is the title of a forthcoming book by Charles Proteus Steinmetz, A. M., Ph. D. This book, which has been edited by Joseph LeRoy Hayden, contains a series of lectures delivered by Professor Steinmetz, under the auspices of Union University, in the winter of 1907-08, to a class of younger engineers consisting mainly of college graduates. In editing the lectures the use of mathematics has been altogether avoided. Robson & Adee of Schenectady, N. Y., are the publishers.

A LAMP WITHOUT PLATINUM

The use of platinum leading-in wires was one of the early inventions in the development of the incandescent lamp, and though complex alloys have been proposed, no metal has completely supplanted platinum to this day, and few suitable materials have been found that possess so nearly the same coefficient of expansion as glass.

In sealing in their filaments the early lampmakers found that after a short period of use the stem around the leading-in wires either began to crack, admitting air and lowering the vacuum, or, equally bad, the air leaked in around the wires when the glass expanded away more rapidly than the conducting material and left a crack. In the tedious work of experimenting that followed Edison was the first to apply platinum, and although the expensive heavy metal of the Urals has advanced in price since, it has always remained the standard for this purpose in lamp manufacture.

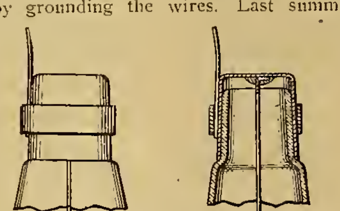
In a recent patent granted to Emery G. Gilson of Schenectady, N. Y., and assigned to the General Electric Company, a form of leading-in terminal is proposed which avoids the use of platinum. Below is a view of the finished lamp provided with the new filament terminals showing some of the parts in section. It will be noted that the lamp bulb and its attached base may be of ordinary construction. The stem of the lamp is not provided with platinum leading-in wires sealed in the glass according to common practice, but is shaped at its upper end into two tubes. As seen in the detailed view and section of the terminal, a metal cap



AN INCANDESCENT LAMP WITHOUT PLATINUM

fits over the end of each of these tubes, forming an air-tight joint, and is clamped to the filaments so that it serves to conduct the current thereto. These caps may be made of copper, iron or other metal having a greater coefficient of expansion than glass. In mounting the caps on the tubes the method is to slip the cap over the end of the tube, then heat the tube in a gas flame until the glass softens, blowing the glass outward by gentle pressure until it makes intimate contact with the metal cap. The joint is then allowed to cool and the greater contraction of the metal causes the cap to grip the glass more tightly as the joint cools. The inventor has found it advantageous to make the cap of sheet metal such as iron or copper, of sufficient thinness to prevent shearing away of the glass when the metal contracts. A thickness of one one-hundredth of an inch or less is quite satisfactory for this work. The tightness of the joint is probably assisted by some combination between the oxidized surface of the metal and the parts of the glass in contact therewith.

The cap may be connected to the external circuit by soldering to a copper wire. The filament, however, is attached to the metal cap without the use of any solder, paste or other binding means by clamping the filament directly against the metal cap by means of a ring or band slipping down over the cap. The metal cap may be made slightly conical to insure a good grip with the ring, but the expansion of the metal during cooling gives the cap a slightly conical shape usually sufficient for this purpose. The improved form of terminal is applicable not only to carbon filaments of usual types, but also to the special filaments, such as tungsten, tantalum, molybdenum, etc. When used in connection with these metals the new support has the advantage that it does not require the use of any carbonaceous paste or binding material within the vacuum and so reduces the danger of contaminating the filament by foreign material.



DETAILED VIEW AND SECTION OF FILAMENT TERMINAL—LAMP WITHOUT PLATINUM

ASYMMETRIC-PATH LIGHTNING ARRESTER

Maurice Milch of Nagy-Bittse, Austria-Hungary, has discovered that the use of different materials in the pairs of opposing electrodes for a lightning arrester presents to the arc playing between them

ASYMMETRIC-PATH LIGHTNING ARRESTER

a resistance or counter-electromotive force which differs according to the direction of the current. A patent granted to the inventor last month describes a form of lightning arrester in which the spark gap, as an asymmetric conductor, is utilized to insure more certain interruption of the arc or discharge current when the direction of potential across the gap reverses.

As shown in the accompanying diagrammatic sketch, the conductors may be in the usual cylindrical form of the so-called multigap arrester. The half-cylinders are formed of brass and iron. The conductors are arranged in two groups, the metals being disposed so that one path most readily serves for current in one direction and the second path for the other direction. The group terminating in an iron conductor presents a path in which brass conductors are always opposed to iron conductors in such a way that current flowing from the line conductor to ground must always pass from brass to iron.

The second or parallel group offers a similar path through which the current from the line must pass from iron to brass. There are, therefore, two parallel paths open to the flow of current from the line, one of these paths opposing a relatively high resistance or counter-electromotive force to the flow of energy, and the other opposing a relatively low resistance or counter-electromotive force. The result is a rapid, if not instantaneous, interruption of the current flow when the potential of the line reverses in direction.

The arrangement of arresters may be inserted from line to ground or line to line.

GROUNDING WIRE FENCES

State Fire Marshal Rogers of Ohio, in reporting to the insurance companies on the heavy loss on live stock caused by lightning carried by barbed-wire fences, says that the remedy is easily applied. The prairie states farm mutual companies find that the loss from lightning along fence wires, which constitute two-thirds of the total loss on cattle, horses and sheep by lightning, can be obviated by grounding the wires. Last summer, in Iowa, a single stroke running on a fence wire killed 19 head of cattle, and in Illinois a case is reported where 28 head were killed. During a storm cattle drift before the wind against a fence, then to a fence corner. Sharp barbs in a wire increase the liability to stroke.

All of the delegates to the annual meeting of the American Association of Mutual Fire Insurance Companies at Denver agreed that the loss of stock from lightning was reduced two-thirds by the grounding of wire fences. The size of the wire used in the different states varies from No. 14 barbed to three-eighths-inch iron rod. The distance advised between ground wires varies from 64 to 200 feet. Near corners and in depressions each post should have a ground wire.

The instructions given by John Emanuel of North Bens, Neb., are terse: "Cut galvanized No. 12 wire in lengths of eight feet. On a rainy day start the boys out with wagon and team, a hammer and fence staples and a wagon-end gate rod. With this rod they can push a hole in the ground beside the post three feet deep. The lower end of the wire goes in this and the upper end projects a little above the fence post. Be sure that this wire is stapled good and solid to every fence wire and the post. This is a good pastime for the boys —better than good hunting."

BIG INDIANA PUBLIC-UTILITIES COMPANY

A great public-utilities corporation having for its purpose the supply of light, power and heat to cities and towns in Northern Indiana and Ohio, has been incorporated with a capital stock of $4,500,000. The directors, most of whom are well known in gas and electrical circles, are Franklin L. Babcock, Anthony N. Brady, Charles F. Dieterich, Frank S. Hastings, James P. Lee, Samuel T. Murdock, Henry C. Paul, Albert Tag and James N. Wallace.

All the directors are New York men except Mr. Murdock, who lives at Lafayette, and Mr. Paul, who lives in Fort Wayne. Officers have not been elected, but it is understood that Mr. Dieterich will be president, and Mr. Murdock secretary and general manager.

The Indiana Lighting Company, as the big corporation will be known, is authorized to supply light, heat and power to Fort Wayne, Bluffton, Montpelier, Anderson, Lafayette, West Lafayette, Logansport, Peru, Wabash, Decatur, Geneva, Berne, Crawfordsville, Lebanon, Thorntown and Frankfort, in Indiana, and to Lima, Wapakoneta, Celina, St. Marys, Greenville, Fort Recovery, North Mercer and Coldwater, in Ohio, and to other villages and towns in proximity to the cities and towns named. The capital stock is divided into 45,000 shares of $100 each and the home office of the new company will be at Lafayette.

"TWO CROSSING" SIGN IN INDIANA

"TWO CROSSINGS" SIGNS

The Indiana Railroad Commission's Accident Bulletin, No. 4, calls attention to the placing of an extra warning "Two Crossings!" sign where the highway crosses two parallel steam or electric lines within a short distance. The commission has been instrumental in having these signs placed at several such electric road crossings in Indiana. The illustration, reproduced from the bulletin, shows a "two crossings" sign on the Boonville division of the Evansville, Suburban and Newburgh Railway Company. The worn "Danger" is painted in red.

WASHBURN WANTS ITS MONEY BACK

Last fall the City Council of Washburn, Wis., purchased the electric-lighting plant from the Washburn Electric Light and Power Company for $22,580.40 and assumed its control, but the city has not been able to make the plant pay. Now the Council has authorized its special lighting committee to annul the sale and demand the return of the purchase money.

SEEING AT A DISTANCE

By A. de Courcy

Mr. Jules Armengaud, a well-known engineer of Paris, has recently experimented with image transmission at a distance, and hopes, by means of his apparatus, to solve this very difficult problem. This refers naturally to what we call "seeing at a distance," and not to the sending of photographic views over a wire, as, in fact, the latter is now accomplished in a very satisfactory manner by Dr. Korn's apparatus, which I have already described in an article published in the Western Electrician some time ago. What Mr. Armengaud wishes to carry out is a method of direct vision by the use of a selenium cell and a rapidly moving apparatus which will cover all the parts of an image in a very short space of time and thus give a practically permanent impression of the whole image on the retina.

There are at present two generally recognized methods by which we may hope to solve the problem of "seeing at a distance." One of these is to decompose a photograph into a number of points, as we have in a half-tone plate, and to transmit each of the points in succession by means of a selenium-cell device. At the receiving station a permanent record would be made of each of the points in a suitable apparatus, so as to reproduce the image in the form of the original.

However, as the number of points is very great, even for a small image, such a method would require a considerable time to cover all the parts of the photograph, or a direct image projected by a camera, and for this reason inventors seek rather to solve the problem by the second method, which consists of covering all the points of the image by a rapidly moving device and to project the light from each on to a selenium-cell apparatus.

The receiving device would move synchronously with the former and would throw a moving spot of light upon a screen so as to reproduce all the parts of the image before the eye would have lost the impression. This would require the whole reproduction to be made within 0.1 second. In this case the disadvantage lies in the great speed which is needed, for a great number of impulses must be sent over the line within this time. The inertia of the selenium cell is another factor, and a leading one, which must be contended with in this solution. Nevertheless, the attention of inventors seems to be turned rather to this method, inasmuch as the other method is counted as almost impossible to carry out in practice.

Mr. Armengaud hopes to construct an appratus which will first cover the whole of the image within 0.1 second and at the receiving end will reproduce it within the same time upon a screen. He has already devised an apparatus, which is illustrated herewith, in order to allow the light from all the points of the image to fall upon the selenium cell in rapid succession. In Fig. 1 is shown a diagram of the transmitter and receiver. The transmitter, seen on the left, consists of a selenium cell S upon which the image, a portrait, for instance, is thrown by means of a lens placed at the left, so as to cover the surface of the cell.

But it is desired to have the cell lighted, not by the whole image, but by a certain small portion of it, representing a "point." This Mr. Armengaud carries out by adapting a moving-picture film apparatus for the purpose. Between the image and the selenium cell is mounted a vertical strip of opaque celluloid photographic film, which runs upon rollers at the top and bottom. This film A serves as a shutter, and it has in it a series of horizontal slots which allow the light to pass through. Between this film and the cell is a second strip B, which is mounted like the former upon rollers, but running horizontally. It likewise carries a set of slots for the passage of the light.

The effect of such a combination will be noticed in Fig. 2, where B is the horizontal strip which moves in the direction of the arrow. It carries the equally spaced slots or openings b, b', etc., which thus pass in succession across the image. In like manner the vertical band A travels from top to bottom, and carries the set of slots a, a', etc. Where the vertical and horizontal slots cross, there will be formed a square opening P which has the size of the element or "point" of the image, and only the light from this point will fall upon the selenium, as all the rest of the light is cut off by the dark strips.

The movement of the vertical band A is rapid, but not continuous, as the band is made to stop for a fraction of a second at the proper intervals. Taking the case where it is momentarily stopped, the slot a''' will have a certain position before the image. The horizontal band will at the same time be in movement so as to allow the transparent spot caused by the crossing of the bands to sweep horizontally across the whole image from left to right. When this is done, the vertical band will be again displaced and a new horizontal slot will come over the image. But it will occupy a position which is higher up (by the width of one point), so that when the next vertical slot of the other band now moves across, the transparent part will sweep across a fresh portion of the image, and so on, until the image is entirely covered from bottom to top. These movements are carried out by an appropriate mechanism by which the film bands are run as endless belts upon sets of rollers, driven at the desired rate by sets of gearing. A small electric motor runs the whole mechanism.

As will be seen, this is only the first step in the problem of electric vision. It remains to be seen how the selenium will behave under such circumstances. The inertia of the selenium can be overcome to some extent by the use of a number of different cells, say, 10, placed on a rotating support, so that one cell is brought automatically opposite the image at each impulse of light; thus the inertia effect would be reduced to one-tenth of what a single cell would give, supposing that the cell would have time to recuperate before it came around again. This method was suggested some years ago.

It then remains to devise a suitable receiver which will respond to this rapid succession of impulses. The inventor wishes to use the type of receiver which is shown in Fig. 1. It consists of an oscillograph O which will respond to very rapid impulses and will throw a spot of light coming from l through a screen C. This screen is of graduated thickness, so as to let pass different amounts of light according to the position of the beam (Mr. Belin's method). The resulting light is sent by the lens L upon the screen D. Before the screen is placed a set of crossed vertical and horizontal moving bands A and B', as in the transmitter. The result will be that the transparent part or spot will cover the whole image in one-tenth second, and, on the other hand, the light will be constantly varying by means of the oscillograph (which receives the current from the selenium cell), so that we will have a reproduction of the original image upon the screen and the eye will perceive the entire image at once.

In Fig. 3 is shown a general view of Mr. Armengaud's transmitting apparatus, with the two crossed films and motor for driving them. Fig. 4 is a detail view showing the crossing of the films and the transparent point located there.

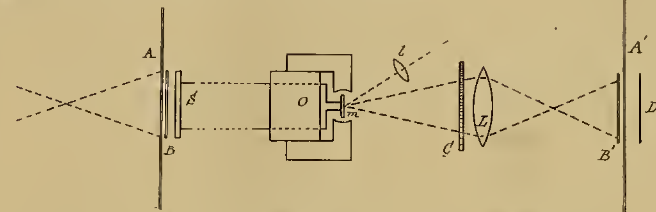


Fig. 1. General Arrangement of Transmitter and Receiver

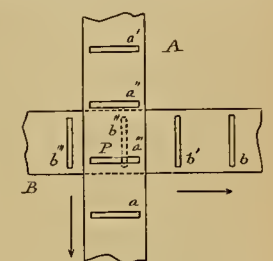


Fig. 2. Crossing of the Film Bands

SEEING AT A DISTANCE

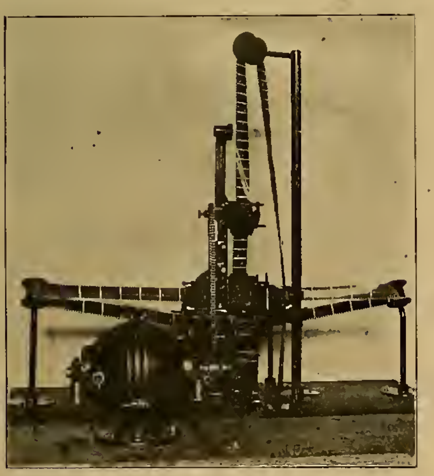


Fig. 3. General View of Transmitting Apparatus

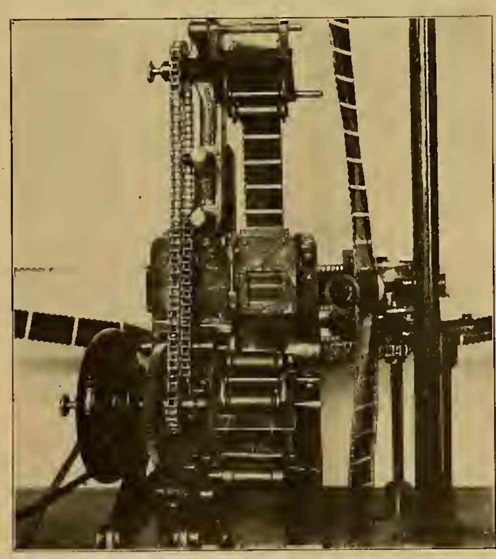


Fig. 4. Detail View, Showing Crossing of Films and the Transparent Point

SEEING AT A DISTANCE

LONG ONTARIO TRANSMISSION LINE

An agreement has been signed by F. H. McGuigan with the Hydro-electric Power Commission of Ontario, for the construction of transmission lines from Niagara Falls to St. Thomas, in the west, and Toronto, in the east, 293 miles in all, for the sum of $1,270,000. The tender is remarkable as being wholly Canadian, which, in the face of so many English and American tenders, is regarded as very creditable to native enterprise. Steel towers, numbering 3,176, will be supplied by the Canadian Bridge Company and the Ontario Iron and Steel Company. They will consume 6,554 tons of steel. The cables will be of aluminum, weighing 1,014,209 pounds. This will be supplied by the Northern Aluminum Company of America, at Shawinigan Falls. For the double telephone lines, over the right-of-way, 140,000 pounds of wire will be required, and guard lines and lightning protection will also take a large quantity of metal. Separate tenders were sent in for several portions of the work, but Mr. McGuigan's tender was lower than the lowest combination of any of these. His tender was therefore accepted on its merits. The work is to be completed within 15 months from the signing of the contract, so that the line will be ready to deliver power in December of next year.

ELECTRICAL DISCHARGES IN HYDROGEN

Following the announcement of a famous scientist that copper and radium had been observed to undergo fundamental changes with time, approaching transmutation of the metals, a Russian chemist, E. Rogovsky, now reports to the Russian Physical and Chemical Journal that the spectrum of hydrogen gas apparently changes with the continued passage of electrical discharges. After directing the sparks from a strong induction coil through the tube filled with hydrogen, the H lines disappeared, and in place of the ordinary hydrogen spectrum there was substituted a new spectrum exhibiting many lines and bands. With the original article a photograph of the new spectrum is given.

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO
TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York
Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

COAL PRODUCTION in California in 1907 was the smallest reported in the state since mining began in 1861, according to Mr. E. W. Parker, of the United States Geological Survey. The increased production of petroleum and its use for fuel purposes have had a demoralizing effect on the California coal industry, and, except for domestic purposes, there is little market for the product. From 77,050 tons in 1905 the coal output decreased to 25,290 tons in 1906, while in 1907 the total production was but 13,950 tons, valued at $38,213.

Fortunately, California, which cuts so little figure in coal production, is abundantly supplied with waterpower, and in no other state or country, with the exception, perhaps, of the Niagara region, is hydro-electric development carried on so extensively. It would be interesting to know how much coal would be needed to do the work of the "white coal" of the mountain streams. No doubt the quantity would reach into millions of tons.

THIRTEEN STANDARD RULES for electric service have been adopted and promulgated by the Railroad Commission of Wisconsin and are given in this issue with official explanatory comment. These rules have the force of law, and it behooves all central-station men in Wisconsin to familiarize themselves with them, while plant managers in other states will be greatly interested, for these standards are in line with the tendency to regulate public-service corporations by state commissions which is observable in various parts of the United States.

The rules apply to every electric-light and power plant in Wisconsin which supplies current to customers. Nevertheless the Commission realizes that local conditions may be such that it would be an injustice to enforce them. Therefore, it is provided that, on application to the Commission, and for sufficient cause, such modifications, exemptions and concessions may be made as the facts in each individual case shall warrant. The Railroad Commission of Wisconsin, in the La Crosse case, already has demonstrated its disposition to be fair—raising rates where it was shown in good conscience that they should be raised—and we have little doubt that, on their side, the central-station companies will accept the present rules in good faith and do their best to live up to them or else to convince the Commission that, in some particular, they are entitled to modification. The saving common-sense clause giving the privilege of appealing to Madison for relief from rigorous enforcement of a rule or rules where it would be an unwarranted burden on the company is an evidence of broadmindedness on the part of the Commission which will be appreciated.

The rules relate to meter testing, interruptions of service, constant voltage, periodic inspection of incandescent lamps, and assisting customers to obtain efficient illuminating service from each company's system. In general they should not bother the large companies greatly, but many of the smaller stations will be put to considerable expense and inconvenience unless the Commission gives them relief. For instance, not all central-station companies in Wisconsin have suitable equipment for testing meters, but each company is required to provide itself with such apparatus. Inasmuch as any consumer can apply to the Railroad Commission for a test of his electric meter, the fee of two dollars to be paid by the company if the meter is found to be too fast, it would hardly seem necessary to require every small central station to provide itself with meter-testing equipment. But nevertheless every electric-light company should be able, Railroad Commission or no Railroad Commission, to test its service meters. The unfortunate fact is, however, that many small stations are not so equipped.

Six per cent. voltage regulation is of course desirable, but many companies will find this an onerous requirement. However, the Commission will perhaps give reasonable leeway here on application. The periodic inspection of incandescent lamps will also give trouble to some companies. Rule 25, relating to "efficient illuminating service," is rather vague and will undoubtedly need further interpretation. Perhaps it hints at high-efficiency lamps, but it is quite indefinite.

The rules were formulated after a conference held in Madison last March attended by about 200 representatives of gas and electric companies. The Commission says that suggestions and criticisms are at all times welcome, and its invitation will be complied with literally, no doubt, for it will be surprising if the majority of plant managers in the state do not ask for modifications. The rules become operative on October 24, 1908, as we understand it; that is, public-utility companies are given three months to comply with the order.

THE ILLINOIS CENTRAL does not equip its suburban service in Chicago for electrical operation because, as an officer of the company is reported to have said, it doesn't want to spend the money. But as the operation of the steam locomotives is particularly offensive to the residents of the South Side of Chicago living near the lake, there is a possibility that the electrification may be compulsory, perhaps by legislative action, in the way of abating a nuisance. Grant Park on the Lake Front will be one of the city's chief attractions when completed, and it is not unlikely that the people will simply demand that the railroad trains passing through it over the Illinois Central right-of-way shall be electrically operated. No doubt the park commissioners understood that the steam locomotives were to be superseded before they began the expenditure of a very large sum of money in filling in the space east of the tracks. It is reasonably certain that the electrical improvement will be carried through at some future time. The Illinois Central will do well to consider whether it will be not in its own interest, considering the amount involved, to make the improvement in its own way, and as soon as possible, before the people become thoroughly aroused on the subject and demand a larger electric zone than would be accepted now, perhaps.

Agitation for the electrification of the Illinois Central in Chicago is bound to continue so long as the company remains obdurate. Electrical men living in this city should lend all possible assistance to this movement.

THERE SEEMS to be no end to the new forms of radiation, or what are thought to be new forms of radiation, which are discovered. One of the latest announcements of this sort comes from the well-known Italian physicist, Augusto Righi, who writes in a recent issue of a Continental scientific journal of what he terms "magnetic rays." This radiation consists of a projection of molecular magnets from the cathode when immersed in a strong magnetic field. The molecular magnets follow the magnetic lines of force, and trace them out visibly. That cathode rays are projected along the magnetic lines of force when the field is very strong was proved as long ago as 1858, by Plücker, and Villard studied this phenomenon in detail two years ago, as Mr. Righi points out. A cathode particle or electron projected along a magnetic line of force describes a spiral whose generating circle is the smaller the stronger the field. The axis of the spiral coincides with the magnetic lines of force, and when the generating circle is very small, the path of the cathode particle cannot be distinguished from the line of force. But these magnetic rays do not, as a rule, convey a charge. Mr. Righi concludes that they really consist of binary systems, an electron revolving round a positive atom, with the plane of its orbit normal to the direction of propagation. Such a system would constitute a very flexible molecular solenoid, and would have considerable stability. A divergent field would produce a retardation of the system, and eventually a return to the cathode.

The subject of radiant matter forms a fascinating field for research, and although the conclusions of the investigators are often contradictory, their studies are important and valuable. Out of a mass of varying theories, it is to be hoped that at last the truth will emerge triumphant.

TUNGSTEN EXPERIENCES RELATED AT MICHIGAN CONVENTION

Grand Rapids, August 18.—About 110 persons were registered as in attendance at the first session of the fifth annual convention of the Michigan Electric Association, which was begun at the Pantlind Hotel, in this city, this morning. The convention hall was lighted by tungsten lamps and was prettily decorated in green and white bunting, with festoons of miniature incandescent lamps. President H. W. Hillman of Grand Rapids was in the chair, and he introduced as the first speaker Mr. S. A. Freshney, general manager of the Board of Public Works of Grand Rapids, who made a cordial address of welcome.

Mr. Freshney said that Grand Rapids is the largest city for its size in the country. He also praised the central-station company, the Grand Rapids-Muskegon Power Company, for its progressiveness. This company, he said, makes very reasonable rates and has a connected load of 250,000 16-candlepower lamp equivalents in lighting and 16,000 horsepower in motors. Mr. Freshney also alluded in complimentary terms to the Citizens' Telephone Company and to the street-railway company.

President's Address

President Hillman followed with a carefully prepared address. He alluded to the new high-efficiency lamps, and said that 75 members of the association have purchased 15,000 of the new tungsten lamps. In the state electric motors of a total capacity of 100,000 horsepower are installed. Electric heating presents a very large field, and great activity is manifested in it. The state is also noted for the boldness and extent of its power transmissions, and, generally, from the electric viewpoint, is in the front rank. Mr. Hillman recommended that the constitution be amended to provide for associate members, that is, for manufacturers and dealers. He pointed out that three-quarters of the electric-light companies of the state are not members of the association, and made an earnest plea for an increase in membership. There was no reason, he said, why the association should not have 1,000 members. Nearly $50,000,000 of capital is represented by the electrical industries of the state of Michigan.

The president was instructed to appoint a committee to consider the recommendations of the presidential address.

Tungsten Suburban Street Lighting

The most interesting and important feature of the morning session was a discussion on the general subject, "Various Experiences with Tungsten Lamps," planned by President Hillman. This symposium was opened by E. F. Phillips of Detroit, who said that the Detroit central-station men were the pioneers of the state in series tungsten street lighting. He described an installation in one of the suburbs of Detroit, lighted by tungsten series lamps. This locality is densely shaded, and there are 42 ornamental iron poles, irregularly spaced, each supporting two 60-candlepower, 75-watt lamps. Service was begun in November last year, the alternating-current supply being 5½ amperes. At first renewals were very numerous, but the current was dropped to five amperes with much better results, and now the cost of renewals is entirely satisfactory. The people are greatly pleased with the service. There was great breakage of lamps at first, but now this loss is small. Mr. Phillips gave these figures for seven months' operation since January 1, 1908:

Average monthly renewals	15.7
Average hours life	1,049
Average kilowatt-hours consumption	1,848
Average cost of lamp renewals per kilowatt-hour	0.83 cent

Canal Street Illumination, Grand Rapids

Fred T. Masterson of Grand Rapids gave some details in relation to series tungsten-lamp illumination on Canal Street in Grand Rapids. The installation consists of 15 spans across the street, with 18 60-candlepower, 75-watt lamps in series on each span. The spans are 100 feet apart. All material, excepting lamps, is owned by the Canal Street Merchants' Association. Lamps and current are furnished by the Grand Rapids-Muskegon Power Company. The initial expense of the installation for material and labor was practically $50 a span, or $750 in all, divided among so many merchants that the individual initial expense was small. The central-station company, as one of the merchants, because of its retail store, stood its pro rata share of expense. The Grand Rapids Electric Company, a supply dealer, did the construction work. The installation is permanent. From all points of view the installation seems to be very successful. It is a forcible advertisement for the merchants, and as the expense of operation is divided among a large number, each individual share is small, some members of the association paying not more than $1 a month. The cost to the company of lamp renewals is one-half cent per kilowatt-hour. The breakage is less than six per cent. The height of lamps from the street is from 25 to 30 feet. Mr. Masterson said that as the life of tungsten lamps is still an uncertain quantity, the company would not care to take additional business of similar character at less than $7 per lamp per year.

A Record of Success at the "Soo"

An interesting and instructive paper, prepared by William Chandler and D. B. South of Sault Ste. Marie, was read by Mr. Chandler. Mr. Chandler considers the tungsten lamp the most satisfactory lamp in artificial illumination. He thinks the Edison company at the "Soo" the first in the country to make a considerable installation of tungsten lamps in a commercial way. The result has been a great success, the company supplying more current rather than less current. Mr. Chandler described a number of commercial installations, and concluded by predicting the general adoption of the tungsten lamp, probably to the exclusion of all others. Mr. Chandler's paper was entitled "Some Tungsten-lamp Experiences," and will be given in full or in long abstract in a future issue of the Western Electrician.

Hart's Street Lighting

Street lighting by tungsten lamps in Hart, Mich., was briefly described by H. A. Chase. There are 62 lamps installed on poles spaced 150 to 200 feet apart, with lamps 12 feet from the ground. The first three burn-outs came after 92, 182 and 184 hours of light, respectively. The lamps have shown no blackening, and Mr. Chase is well pleased so far with his experience.

Will the Tungstens Light the Workingman's Cottage?

A. C. Marshall of Port Huron, the secretary of the association, reported the experience of that city. Here the lamp comes into play in going after gas-light users, the idea being to get enough new business to offset any loss of income from old customers due to the use of the high-efficiency lamp. Tungsten fixtures are sold at actual cost, but lamp renewals are made at list prices. Sixty-watt and 100-watt sizes are used. Mr. Marshall is not quite sure that enough new business can be obtained to offset the decline in income from old customers. He has been studying the problem of securing small-residence business, say, even, workingmen's cottages, where not to exceed three lamps will be burning at one time. Perhaps with the use of a current regulator, preventing the burning of more than three lamps at once, and thus fixing current consumption, it may be possible to adapt the tungsten lamp to this great and almost entirely unoccupied field of residence illumination. The speaker exhibited curves to illustrate his ideas on the subject.

Mr. Dow on the Situation

Alex Dow of Detroit was the next speaker. He said that he was greatly interested in Mr. Marshall's remarks. The small householder is afraid of the cost of electric lights. On the other hand, it costs the central-station company in the city from $40 to $50 to put an ordinary small house on the company's circuits. This is due to the cost of meter, transformer, wiring, etc. Anything that tends to reduce this cost is exceedingly welcome. Mr. Marshall's suggestion should therefore be given attention. A regulator, for instance, would only cost half as much as a meter. Perhaps the cost of service wiring would be less also. But in large cities, where underground construction is required, it is to be feared that the business of the medium-sized house will not be sufficient to warrant the expense of extending underground mains to secure it. Perhaps something can be done, where overhead wires are permitted, with the workingman's cottage idea.

Central-station companies themselves must control the tungsten-lamp situation. It is doubtful if the lamp will remain as it is today. Probably it will take a different final form, having greater strength, longer life and lower cost. In any event, this final form must be worked out in practice, as is actually being done at the present time. The tungsten lamp has come to stay. In series street lighting, the lamp has arrived "with both feet." Where a certain amount of light is to be furnished, as in street lighting, the tungsten series lamp is extremely serviceable. And after all the adjustments of the future are made, the lamp will no doubt "arrive" for all forms of commercial illumination.

Other Experiences

Darwin D. Cody of the Grand Rapids Electric Company spoke briefly, giving his experience with the tungsten lamp. His opinion was entirely favorable.

W. J. Trott, Michigan manager for the Fostoria Incandescent Lamp Company, spoke of the recent improvement in tungsten lamps as to size of units and the like.

Fred T. Benson, manager of the tungsten-lamp department of the Chicago office of the General Electric Company, said that perhaps the new 250-watt tungsten will in many cases take the place of the arc lamp for street lighting. Experiments are under way in the direction of strengthening the filament, perhaps by alloying the tungsten with other metals. When this is accomplished, the tungsten lamp will be the greatest the world has ever known.

Mr. Westover, a central-station manager from Cadillac, believes in going after the small-residence lighting consumer. He has 300 customers on his books who earn wages not exceeding more than $2 a day, and these workingmen are able to afford electric light in their homes. He uses one transformer in the center of a block of houses. A meter is installed for each customer, and the company gets from $9 to $15 a year from each user of this class. This state of affairs can obtain only in a small town where simple overhead construction is permitted.

After a brief executive session adjournment was taken until tomorrow morning. W. E. K.

[The report of the sessions of Wednesday and Thursday, with mention of the numerous entertainment features provided, will be given next week.]

WIRE DIRECT FROM CRUDE COPPER

By the invention of Sherard Cowper-Coles it has become possible to produce copper wire in one operation from crude copper, such as Bessemerized copper bars. The copper is deposited electrically on a revolving mandrel or drum rotated at a critical speed which gives the most dense, tough and smooth deposit. This speed may be found experimentally by rotating a cone-shaped cathode for a time while the electro-deposition of the copper is going on and then determining the region of the finest deposit.

An explanation of the process is that each molecule of copper as deposited is burnished by the friction of the electrolyte. This would be expected to insure a very homogeneous metal, and it is declared that the result obtained is actually more regular than can be obtained by applying great pressure to a large mass in the way of rolling, drawing or hammering.

As the copper so deposited crystallizes at right angles to the surface upon which it is formed, a spiral V-shaped scratch is made on the mandrel, along which the crystals form a weak line of cleavage. No line of cleavage is produced if the base of the scratch is rounded, as the crystals would then form radially. It is said that four or five miles of wire may be made on a single mandrel. The strip has only to be unwound, separating along its natural line of cleavage and passed through a set of dies which remove the burr or fin and form a round section.

The copper produced by this method is explained to be very dense and to possess a considerably higher tensile strength than possible with the usual methods of annealing and drawing or rolling.

The electric automobile is a country, as well as a town, car and to prove it last week, F. J. Newman, manager of an electric-vehicle company in Chicago, drove an electric victoria from Chicago to Milwaukee, a distance of 93 miles by wagon road, in eight hours and 43 minutes. This is the first time that the Milwaukee-Chicago run has been made by an electric vehicle on one charge of the batteries. The roads were in fairly good condition and no accidents were reported.

RULES AND REGULATIONS REGARDING ELECTRIC SERVICE IN WISCONSIN [1]

The condition of the industry based upon supplying electrical energy to the public is an unsettled and unstable one, due to continual and rapid developments of new and improved apparatus and methods, to the new uses being found for electrical energy and to the rapid increase in the general demand for this form of energy.

In formulating definitions of adequate service and rules for securing the same, recognition must be made of the rapidly changing conditions to which the electrical energy-supply industry is subjected. It is also obviously desirable that rules shall not be adopted which will interfere with the natural growth or progress of the industry.

It appears impracticable to adopt a definition of, or rule for, securing adequate service in connection with each particular use to which electrical energy is supplied, on account of the great multiplicity of definitions and rules which would thereby result. The purpose here is to make the definitions and rules as few as possible and of such a character as will insure to the majority of consumers adequate service.

Adequacy of electrical service may be considered under the following classifications:

1. Accuracy of meters.
2. Regulation of pressure.
3. Efficiency of devices for utilizing electrical energy.

1. Accuracy of Meters

Electrical energy is sold by charges which are based upon the quantity of electrical energy delivered. This quantity is generally measured by electric meters.

It is a well-recognized fact that it is impossible for an electric company to measure with absolute accuracy energy which is delivered to each of its customers. This is due to the deficiencies and inaccuracies of electric service meters which are commercially available.

Progress is being made and will undoubtedly continue to be made in the meter industry, and meters purchased some years ago are usually less accurate than those of more modern types.

It is a well-demonstrated fact that an electric meter, during its operation in service, tends to become inaccurate, and there are numerous accidents or causes contributing to this, most of which tend to cause it to run more slowly and consequently register less than the amount of energy which is actually delivered. It is the exception rather than the rule that the inaccurate electric meter over-registers.

The common method of determining the accuracy of a meter consists of comparing its registration with that of standard instruments. These standard instruments are subject to some error, even though frequently calibrated, so that, in maintaining a meter-testing department, it is necessary to standardize frequently the electrical instruments used as standards. Since it is impossible to measure electrical energy with absolute accuracy, even with standard instruments, and since commercial electric meters have variations in accuracy and have marked tendencies to become more inaccurate when retained in service, it becomes necessary to define a commercially accurate instrument as one which has a limit of error of a certain amount.

Electric service meters are usually installed of such size as to take care of the electrical energy being delivered to a consumer at the period of the greatest demand, but it is evident that the accuracy with which the meter registers may vary with the varying load placed upon the circuit. A meter which is accurate when running at its maximum capacity or upon its average load may not be accurate when only a small quantity of energy is being delivered, and it is a common tendency for electric meters to be especially inaccurate at periods of light load. Many meters are found in service which will not register the current consumed by a single incandescent lamp, and sometimes several incandescent lamps may be turned on before the meter begins to operate. Since the condition frequently and continually exists where a consumer is using only one or two lamps, this may result in a large aggregate amount of energy being supplied and not accounted for. A meter whose registration may be much in error on light loads may have a high degree of accuracy as the load increases, and to express the true accuracy of the meter, it should be stated in terms of percentage of accuracy taken at various rates of operation.

The accuracy of an electric meter shall be determined from readings taken at full load, half load and light load, full load meaning the rated capacity of the meter, half load being one-half of that rate and light load being in the neighborhood of 10 to 20 per cent. of the full rated capacity. It is naturally to the interest of the electric company that meters which do not register at loads less than 10 per cent. of their capacity shall not be retained in service, and it is similarly to the interest of the consumer that instruments which register or "creep," as occasionally happens, when no energy whatever is being delivered, shall not be kept in service.

Rule 14. No electric meter which registers upon "no-load" shall be placed in service or allowed to remain in service.

It appears possible so to adjust a meter that it will register within two per cent. of accuracy at various loads, but to maintain it in service with this degree of accuracy for any considerable period of time appears to be impracticable under present conditions. It is necessary, therefore, to allow a greater range of inaccuracy, and, until further notice, four per cent. shall be regarded as the limit of error which is permissible.

Rule 15. No electric meter shall be placed in service or allowed to remain in service which has an error of registration in excess of four per cent. on light load, half load or full load.

To insure that an electric meter does not develop an error greater than four per cent. makes it necessary that an occasional inspection and test of the meter be made. The practice in this respect varies widely among different companies, some allowing their meters to go uninspected for two or three years, while with the majority of well managed companies it appears to be the practice to test each meter at least once a year, and some meters more frequently.

Rule 16. Each electric service meter shall be tested and adjusted for accuracy at the time of its installation.

Rule 17. Each electric service meter shall be tested at least once each year; the test to be made by comparing the meter while connected in its place of service with suitable standards, on light load, half load and full load at rate of operation.

Rule 18. A complete record shall be kept of all tests made on electric meters.

Rule 19. Each company supplying electrical energy shall provide itself with suitable equipment for the testing of meters, and shall employ such methods as are approved by the Railroad Commission.

It is impossible to specify in detail the methods and instruments which should be employed in testing electric meters. There are various standard instruments which give satisfactory results, and manufacturers are continually making improvements in testing equipments. It is the purpose of the Railroad Commission, through its engineering staff, to keep informed regarding the improvements which are being made and of the various approved methods of testing, and from time to time such information will be placed at the disposal of the electric companies operating in this state.

While it is a common practice for electric companies to conduct all of their meter tests with the meters removed from their place of service and taken to a testing laboratory, this does not appear to be a desirable practice, since a meter which shows accurate registration in the laboratory may not be accurate when placed in service. It is considered highly important, therefore, that tests of accuracy shall be made with the meter in its place of installation.

In addition to the installation test and the yearly test made upon each meter, it is desirable that provision be made on the part of the company for testing meters at other times upon request of any consumer who believes his meter to be registering inaccurately. It is a common practice among electric companies to make these tests free of charge. The following seems to be, therefore, a desirable provision:

Rule 20. Each company supplying electrical energy shall make a test of the accuracy of a meter upon request of a consumer, provided such consumer does not make request for tests more frequently than once in six months. A report giving the results of such tests shall be made to the consumer, and a complete record of the same shall be kept on file in the office of the company.

Rule 21. Upon formal application of any consumer to the Railroad Commission a test shall be made upon the consumer's meter by an inspector employed by the Railroad Commission, such test to be made as soon as practicable after the receipt of the application. For such test a fee of two dollars shall be paid by the consumer making application for the test if the meter is found to be slow or correct within the allowable limit, and by the company owning the meter if the meter is found to be fast beyond the allowable limit.

2. Regulation of Pressure and Control of Service

The value of electrical energy, as furnished to a consumer, is not proportional alone to the amount of energy as measured by an accurate electric meter, but is dependent upon various other factors, including the efficiency with which the electrical energy can be transformed or translated into other useful forms. The consumer uses the electrical energy for securing light, heat and mechanical power; and for the transformation into these more directly useful forms various translating devices are employed. The adequacy of the service is dependent in large measure upon the efficiency of these translating devices.

For the production of illumination, translating devices include various forms of lamps, such as the carbon-filament incandescent lamps, the tantalum and tungsten incandescent lamps, Nernst lamps, mercury-vapor lamps and the numerous types of arc lamps. For the production of mechanical power motors of various kinds are employed, and for electrical heating, the translating devices comprise various forms of resistances.

Not only is it upon the efficiency of such translating devices that the adequacy of service largely depends, but this efficiency is in turn dependent upon numerous factors, including the type of device, its condition as regards age, state of maintenance, and the like; and the efficiency also depends upon certain characteristics, or, what might be called qualities, of the electrical energy supplied.

Among the characteristics of the electrical energy to be considered are the following: Whether direct or alternating current; if alternating current, what frequency of alternations; the normal voltage at which current is delivered; and, most important of all, the degree of constancy at which the voltage is maintained.

By far the larger proportion of electrical energy sold by urban electric companies is delivered on so-called constant-potential circuits. It is from such circuits that energy is taken for the majority of the various uses of the consumer. Constant-potential distribution is to be considered primarily in establishing rules for adequate service.

In considering the various kinds of service rendered from constant-potential distribution systems, it is apparent that illumination by incandescent lamps is the one involving the greatest amount of energy and concerning the greatest number of consumers. It is this service which is the most exacting in the matter of voltage regulation and other qualities of electrical energy, and consequently, in establishing rules which will insure adequate illuminating service, such rules will at the same time secure amply adequate service in the various other uses of energy derived from the same circuit.

In past practice the question was not settled as to how far an electric company is responsible for securing adequate service to its consumers. There is no unanimity of opinion among electrical authorities upon it. Some hold that the electric company has discharged its obligation when it furnishes the facilities for drawing uninterruptedly the amount of electrical energy which a consumer requires, and that it is not responsible for the translating devices which the consumer employs, even though the use of such translating devices may result in an exceedingly inefficient use of the electrical energy. Other authorities hold that the electric company is in a measure responsible for the efficiency of the translating devices employed, this responsibility placing upon the company a duty of furnishing to the customer the greatest amount of light, heat or power for a given consumption of electrical energy. The companies operating under the former policy leave it largely to the consumers' judgment as to what type of lamp or other device he will employ. The companies accepting additional responsibility for adequate service usually consider it for the interest of all concerned to make the charge for electrical energy sufficient to enable them to furnish new lamps free of charge, when the lamps which have been in service have deteriorated in efficiency to a certain point. It is also a common practice among electric companies to place upon sale the apparatus which they specially recommend, this apparatus being furnished by some at actual cost and by others at a dealer's profit.

The exact form which the so-called "free-lamp-renewal" policy takes varies with different companies. In some cases the first installation of lamps is charged for at cost; in other cases no charge is made. Some companies make free renewals only when the lamp filaments have burned off; others make renewals when lamps have become dimmed by use. Some companies make the renewal only when lamps are brought into the office, while others employ inspectors to visit the consumers periodically and renew all lamps which have become blackened or otherwise deteriorated by use.

It does not appear practicable to establish uniformity in the method of lamp renewals as practiced by the different companies, since the best practice in one plant may not be the best for another working under different conditions. The changing status of the art of incandescent illumination, and especially the recent introduction of the high-efficiency tungsten and tantalum lamps, makes it ex-

1. Acting under the mandate of the Public Utilities Law, the Railroad Commission of Wisconsin has adopted standards for gas and electric service in that state. Of 25 rules 13 relate to gas service. The rules for electrical operation, with the comment of the Commission, are given here. The rules are in bold-face type. They were adopted July 24, 1908, and after three months from that date every departure from these rules will be regarded as a violation of the law, unless express permission is granted by the Commission. The Commission realizes that local conditions may make exceptions necessary, and where such conditions exist application should be made to the Commission at Madison, Wis., for exemption or modification. The standards were adopted after a careful investigation conducted by Prof. W. D. Penee, chief engineer, and Prof. C. F. Burgess, expert for light and beat, both connected with the University of Wisconsin.

ceedingly difficult to determine upon a uniform lamp renewal policy which is entirely satisfactory from the standpoint both of protection to the consumer and of business management for the company.

It is a well-known fact, and one confirmed by observation of the inspectors on the engineering staff of the Railroad Commission, that much of the unsatisfactory service comes from neglect on the part of the electric company or from lack of information on the part of the consumer as to some of the characteristics and practical limitations of electric illumination.

The amount of illumination which can be secured from a given amount of electrical energy consumed in the ordinary type of incandescent lamp depends upon the design of the lamp and the materials and processes used in its manufacture, upon the voltage at which it is designed to operate, the voltage at which current is supplied to it, its period of service, the cleanliness of the outer surface of the glass bulb, as well as upon various other factors.

The incandescent lamp of the ordinary type is rated in terms of its efficiency, its capacity, and its normal voltage.

The efficiency of an incandescent lamp is usually stated as the rate at which the electrical energy is used per candlepower developed, or "watts-per-candle." A consumption of four watts per candlepower is frequently encountered; 3.2 watts, or thereabouts, is the figure for the most efficient types of carbon lamps now on the market, and an efficiency as high as 1.25 watts per candlepower has recently become possible through the introduction of the tungsten and other metal-filament lamps. The efficiencies practically attainable, therefore, lie between 4 and 1.25 watts per candlepower, and the most satisfactory efficiency for the consumer depends upon various factors, including the cost of the lamp, life, durability, etc.

The normal voltage is that voltage which will permit of a lamp's giving best service with due regard to efficient life. The art of lamp manufacture has not reached a state of perfection which makes it possible to predetermine exactly what the normal voltage of a lamp may be, and its rating must be determined after manufacture. It is for this reason that it is impracticable for all companies to employ the same voltage lamps, and consequently to operate its circuits at the same voltage. The most common operating voltages lie between 100 and 120 volts, or 200 and 240 volts. If all circuits were operated at a standard voltage of 110, the demand for 110-volt lamps would become excessive, and in their manufacture there would be a large by-product of other voltage lamps which would have to be discarded or else given an erroneous rating, which would result either in excessive cost of lamps, or inadequate service. One of the determining factors, therefore, in the fixing of a standard voltage on a distribution system is the possibility of securing incandescent lamps suited to that particular voltage.

The effect of supplying to an incandescent lamp a voltage higher than that at which the lamp is rated, is an increased efficiency, which advantage, however, is more than counterbalanced by a more rapid deterioration of a lamp and a decrease of its life. The effect of supplying too low a voltage to a lamp is to reduce its deterioration and to increase its life, with the more marked disadvantage, however, of greatly decreasing its efficiency of illumination.

Every incandescent lamp enters a period of deterioration as soon as it is placed in service, this deterioration being caused by a change in the filament through a process akin to evaporation, resulting in an increase in the resistance of the filament, a blackening of the globe from the internal deposit of carbon, and a falling off in the efficiency. The rate of this deterioration depends upon the make of lamp employed and the voltage to which it is subjected.

The ultimate life of an incandescent lamp may be expressed as the number of hours during which it will continue to give illumination, this period being usually terminated by a burning away or rupture of the filament. It is recognized as exceedingly bad practice to allow lamps to remain on circuit until this point has been reached, since the deterioration in efficiency will have become such as to make it uneconomical of operation. It is better practice, and one more commonly prevailing, to express the life of a lamp as the number of hours at which it will operate at normal voltage before its efficiency falls to a value below 80 per cent. of the efficiency of the lamp when new. This length of life, as commonly attained in the better grades of carbon-filament lamps now manufactured, is in the neighborhood of 600 hours, and to allow a lamp to burn longer than that period usually results in what might be termed inadequate or uneconomical service, due to excessive deterioration.

3. Efficiency of Devices

From observations thus far made by the inspectors of the Railroad Commission, it appears that the chief causes of complaints of electric service may be classified somewhat as follows:

Interruptions.—The frequency of interruptions of service to which consumers are subjected may range from several times per year in some plants to almost daily recurrences in others, depending upon the management and upon the various conditions under which the power is generated and distributed. Whether such interruptions of service are indicative of poor management or are due to unavoidable accidents, they are invariably a cause of dissatisfaction on the part of consumers, and it is incumbent upon every electric company to reduce the interruptions of service on its entire system or any portion of it to the smallest number possible.

Unsuitable Voltage.—Instances may be frequently found where the voltage at which a system or portion of a system is operated, is unsuited to the translating devices used thereon. This may be due wholly or in part to neglect or poor judgment on the part of the management of the company, or to inadequacy of the plant, or it may be beyond the control of the company through the use of improper devices purchased by the consumers. Too low voltage becomes at once apparent through dim illumination, and some electric companies, who find it impossible to maintain an exact standard voltage, adopt the questionable practice of maintaining a voltage considerably above standard at some or all parts of the system, to avoid dropping below normal at any part. They justify this by urging that higher efficiency of illumination is thereby secured, although, as previously pointed out, this results in more rapid lamp deterioration and necessitates more frequent lamp renewals, with the attendant trouble and expense.

Fluctuating Voltage.—Fluctuations of voltage, found on nearly all electrical distribution systems, are disadvantageous, not only by introducing the disadvantages of abnormally high or abnormally low pressures, but also by causing a disagreeable fluctuation or flickering of the lights. This defect also gives the consumer the impression that the inefficient illumination is being secured at all times when the pressure is below the maximum, even though the pressure may actually be of a value which, under constant operation, might be considered as normal.

Operation of Lamps Beyond Their Period of Useful Life.—One of the most common causes of poor service is due to the operation of incandescent lamps after they have depreciated below 80 per cent. of their original efficiency. Where renewals are paid for by, and are under the control of, the consumer, the consumer is chiefly responsible for this feature of inadequacy, and where the company makes so-called free lamp renewals, the responsibility for this inadequacy lies primarily upon the company. It is a noteworthy fact that, whichever party assumes the responsibility for lamp renewals, there is, almost invariably, a disinclination to destroy a lamp which is still capable of giving illumination service and to meet the expense of installing a more efficient new lamp.

Dirty Lamp Globes.—It is a fact not sufficiently recognized that the accumulation of dust, oil and dirt on the outer surface of an incandescent lamp will materially reduce its efficiency, and many instances exist where the illumination may be increased from 5 to 10 per cent. by cleaning the globes.

Inadequacy of Wiring in Buildings.—One of the most serious causes of inadequate service is insufficient size of the wires installed in buildings, causing a reduction of the voltage. This may result from poor design or false economy in the original installation, but in many instances is due to the growing demand for more current than the original installation of wiring was intended to provide for. Poor electric service may result from such inadequate wiring, even though the company may supply a satisfactory voltage to the inlet of a building. It appears to be almost universally true that the electric company is not directly responsible for such interior wiring.

From the above statement of the causes of inadequate service, it appears that in some cases the electric companies are at fault; in other cases the responsibility may lie with the consumer, while in others there is a joint responsibility. There are, therefore, no rules which can be laid down for the control of electric companies which will absolutely secure adequacy of service, for there seems to be a necessity of some co-operation between the companies and their customers; and helpful co-operation can hardly be developed by compulsory rules. There are, however, certain obligations which rest independently upon the public-service electric company which may be expressed in the following rules:

Rule 22. Each company supplying electrical energy shall maintain a record of all interruptions of service upon the entire system or major divisions of its system, and include in such record, time, duration and cause of each interruption.

Rule 23. Each company supplying electrical energy on constant potential systems shall adopt and maintain a standard average value of voltage as measured at any consumer's cut-out, which shall remain constant from day to day, and vary during any one day by an amount not more than six per cent. of the minimum value.

From the standpoint of ideal service, a six per cent. fluctuation in voltage may appear to be excessive, and it is probable that a closer regulation may be required in the future, but under the changing conditions at present existing and the rapid growth of electrical distribution in this state, it appears that a rigid enforcement of this requirement will result in a marked improvement in the quality of service which has hitherto been furnished by the majority of the companies in this state. It appears also that some time may elapse before all the electric companies may find it possible to meet these requirements, since it may involve the redesign and reconstruction of many distributing systems, the installation of regulating devices, etc. In such cases companies should confer promptly with the commission.

Rule 24. Each company supplying electrical energy for incandescent illumination shall adopt and maintain some method of procedure which will insure periodic inspection of incandescent lamps to which current is supplied and under which the company will render its consumers assistance in securing incandescent lamps best adapted to the operation of the system. Each company shall submit to the Railroad Commission of Wisconsin the details of such method of procedure as it may adopt.

The assistance offered by the companies may take various forms; for example, it may consist in furnishing information or specifications upon which satisfactory lamps may be purchased; or in maintaining a sales department supplying suitable incandescent lamps to the consumers; or in maintaining the so-called free-lamp-renewal policy whereby the cost of renewals is included in the scheduled rates. It is, of course, understood that such assistance as may be rendered shall be afforded to all consumers without discrimination.

Rule 25. Each company supplying electrical energy for incandescent illumination shall specifically inform each of its consumers as to the conditions under which efficient illuminating service may be secured from its system.

It is believed that the above rules and regulations will tend toward insuring adequacy of service, and that at the same time they are not inconsistent with good plant management from a purely business point of view. It is evident that through subsequent development in the electrical art, better service can be secured in the future than is now practicable of attainment. Future modifications of the definitions of adequate service and of the above rules and regulations for securing the same will probably become necessary.

TELEPHONE COMPETITION IN BOSTON

The question of the relative advantages of regulated monopoly and keen competition, as applied to the operation of public-service corporations, has been brought to the front again in Boston by the filing of a bond for $50,000 on the part of the Metropolitan Home Telephone Company, which was organized a few years ago with a view to competing with the New England Telephone and Telegraph Company in rendering service to Boston and vicinity.

The company secured a franchise, despite considerable opposition, in December, 1906, by a vote passed by the Boston aldermen over the mayor's veto, but had done nothing thereunder until the bond was filed this week and announcement was made that it was ready to proceed shortly with construction work. Then the opposition got busy anew, and the present mayor was asked not to allow the streets to be opened for the purpose.

An opinion was also rendered by the city solicitor to the effect that the company now has no rights under the 1906 franchise, as it did not file its bond and take steps to proceed with the exercise of the franchise under the administration which granted it. He states that no board can bind a future board to carry out acts not begun under its own regime.

As was to have been expected, however, upon the refusal of Wire Commissioner Cole, acting under direction of Mayor Hibbard, to permit the work of opening the streets and laying conduits and wires to proceed, the attorney for the Metropolitan Home company declared his intention of going to the courts for a mandatory order.

The opposition to the new company is based chiefly upon the claim that the presence of two systems in the city would make it necessary for many business concerns to become subscribers to both services, and thereby increase the cost of telephone service generally throughout the city, and that the disadvantages for a large percentage of the merchants and manufacturers of Boston, arising from the installation of a dual service, would far more than offset the advantages accruing from competition.

HIGHLAND PARK COLLEGE OF ENGINEERING

The Highland Park College of Engineering at Des Moines, Iowa, offers, besides the usual collegiate engineering branches, a number of briefer and practical courses in electrical and mechanical instruction. The college has founded its work on the proposition that the range of engineering is so great that young men of all degrees of engineering capacity may be provided for. No great skill or education is required to become a gas or traction engineer, says President O. H. Longwell, while a finer degree of mathematical and scientific education is needed by the finished civil, electrical or mechanical engineer.

Young men who have no liking for literature and the classics and who could hardly be induced to take a classical course in college will often become good students in the department of engineering, Dr. Longwell adds. Their intellectual training for a thorough course in engineering is equally as complete as one can get in a classical course, and the world of thought opened up is great and beautiful.

The Highland Park College of Engineering sends traction engineers to Minnesota, the Dakotas, Kansas and Canada, while the graduates from the civil, electrical and mechanical engineering departments may be found on the Isthmus of Panama, on the great battleships, constructing irrigation dams in Idaho and the West, in Washington, D. C., at the head of the Irrigation Bureau, in bridge and automobile factories, electrical houses and river-improvement surveys.

President Longwell has for 30 years been training boys for life and has built up an important

A VIEW IN THE SHOPS AT HIGHLAND PARK COLLEGE

technical school in order to be able to train men for the line of work for which their natures and ability best fit them. He will be glad to confer with parents and young men who wish to be advised upon this subject.

The buildings of Highland Park College are commodious, well constructed and architecturally attractive.

The mechanical and electrical engineering workshops occupy brick buildings, erected on the campus expressly for their accommodation. The steam-heating and electric-lighting plants adjoin the workshops.

The electrical department has its office, recitation room and laboratories in the basement story of Humboldt Hall. The workshop for the electrical and mechanical courses is located in the basement of Lowell Hall. A course in telephone engineering is a branch of the regular electrical instruction.

The short course in electrical engineering is designed to prepare young men for the superintendency of electric power and lighting stations. The course includes those branches in mathematics and science which will be of direct use to the graduate, and a thorough study of the elements and practical application of electricity. It is at the same time brief and comprehensive, and is sufficiently thorough to prepare a young man for a responsible position. A diploma is awarded upon completion of this course. There are no entrance requirements further than common-school education.

CHICAGO STREET RAILWAY CO-OPERATION

The Chicago City Railway Company is now operating the former lines of the Calumet and South Chicago Railway south of Sixty-third Street. This is regarded as the first step in the complete consolidation of the two companies which street-railway men regard as impending. The business affairs of the Calumet company are in such a shape that a clear transfer of title is impossible at this time, so a temporary arrangement has been reached. The working agreement provides that the Calumet company shall preserve its separate legal existence, but the Chicago City shall run the road.

Passengers on through route No. 22 of the Chicago City Railway under the interchange of transfers between that line and the Calumet and South Chicago Company now are enabled to ride from Howard Avenue, the south boundary of Evanston, to Manhattan Beach at Seventy-ninth Street and the lake for a nickel. A through route of the Chicago City Railway running over Cottage Grove Avenue and into South Chicago is one of the possibilities under the present arrangement.

Mr. A. L. Drum was recently appointed the representative of the Calumet and South Chicago Railway on the Board of Supervising Engineers, Chicago Traction. The recent city ordinance gave the Calumet lines a franchise for 20 years, with the provision for the complete rehabilitation of its tracks within three and one-half years.

ELECTRIC HEAT FOR TIRE REPAIRS

The difficulty in securing a proper temperature and in regulating the heat with the ordinary portable vulcanizer outfit for repairing automobile tires has led to the invention of an electrical vulcanizing apparatus by F. J. Gornall, an English motor-car expert. With this device the necessary heat is obtained in about three minutes, since the heat is not spread over a larger area than is absolutely necessary, being conserved strictly to the surface used for vulcanizing. This economy of heat also renders it possible to generate the required temperature from current obtainable from the ordinary four-volt ignition battery usually installed on motor cars. The amount of electricity consumed from such an accumulator is about one-half ampere-hour for each square inch of tire surface repaired; hence an ordinary ignition accumulator will repair with one charge 60 square inches of surface or 30 repairs of two square inches each at an estimated cost of about one cent for each repair. The temperature of the heater is automatically controlled by the use of a resistance element having a temperature coefficient such that the heat cannot increase beyond the proper value on account of the resistance rise of the heater.

BELL TELEPHONE FINANCIAL REPORT

The figures of all the associated Bell telephone operating companies, exclusive of the long-distance lines of the American Telephone and Telegraph Company, for the first half of the current year are available for comparison and make the following showing:

	1908.	1907.	Increase.
Telephone revenue	$58,827,400	$55,272,600	$3,554,800
Expenses	43,424,700	40,953,000	2,471,700
Net	$15,402,700	$14,319,600	$1,083,100
Other income	2,509,400	2,249,100	260,300
Total net	$17,912,100	$16,568,700	$1,343,400
Interest	3,902,600	3,426,300	476,300
Balance for dividends	$14,009,500	$13,142,400	$ 867,100

Included in the expenses are $16,845,600 for maintenance, an increase of $1,780,700, and $2,510,300 for taxes, an increase of $251,400.

The telephone revenue for June was $10,012,700, expenses $7,386,300, net $2,626,400. Other income added $451,800, making the total net for the month $3,078,200. Deducting interest charges of $646,700, the balance for dividends was $2,431,500.

TRANSCONTINENTAL TELEPHONE LINE

A thousand-mile telephone line from El Paso, Tex., to Redlands, Cal., now being built as rapidly as the contractor can put the job through, will be the connecting link in the first transcontinental telephone system. Within a few months Southern California will have direct telephonic connection with El Paso. Almost a million pounds of copper and 30,000 poles will be required for the main line. Several feeder lines are included in the contract, one to be built into the Imperial and Coachella valleys and another into the Salt River Valley in Arizona. Other systems already built and now building in Arizona and New Mexico will be made feeders to the main line. The line will follow in general the main-line tracks of the Southern Pacific Railroad.

QUESTIONS AND ANSWERS

VOLTAGE ON THREE-PHASE SYSTEM

F. J., Chicago: Please explain why it is impossible to obtain more than 220 volts from a three-phase secondary system built for that voltage.

ANSWER

This question is not very clear. The inquirer may have in mind a comparison between this system and a three-wire direct-current system, in which the voltage between the outside wires is twice that between either wire and the neutral, because the two halves of the generating end of the system are in series and in phase with each other. In the three-phase system, however, the three branches are each 120 degrees apart in phase and form three symmetrical interconnected circuits, so that the voltage between any two mains is always the same.

If the three-phase system in question has the transformer secondaries connected in delta so as to give 220 volts between any two mains, the voltage between these mains can be increased to 381 volts by connecting the secondaries in star, because two secondary coils having each 220 volts 120 degrees apart in phase are now connected in series, so that the combined voltage between any two mains is $\sqrt{3}$ times 220.

POLARITY OF DIRECT-CURRENT RAILWAYS

W. H. T., Chattanooga, Tenn.: Why is it customary to make the trolley wire of a street-car system positive? Could it be operated with the wire negative and the rails positive?

ANSWER

An electric railway can be operated just as satisfactorily, as far as the cars and motors are concerned, whether the trolley wire is positive or negative or in one section positive and in another separate section negative to the rails. This is because the direction of rotation of a railway motor is not changed when the polarity of the line terminals is reversed.

The trolley wire is always made positive to decrease the damage to underground cables, water and gas pipes caused by electrolysis from stray currents leaving the rails. Where the current enters any of these underground conductors no damage results, but where it leaves them to again follow the path of the rail serious pitting of the pipe or cable occurs. By making the trolley positive the return current is carried by the rails and, if at any place on the system it leaves the rails to follow a better path through parallel piping, no damage takes place at these scattered points. In general, where it leaves the piping will be near the power house, where in a restricted area the pitting may be prevented by connecting the adjoining pipes to the negative bus of the system through an auxiliary conductor. Thus the cost of this protection is greatly reduced.

REVERSIBILITY OF THOMSON WATT-HOUR METERS

T. S., Helena, Mont.: Can the ordinary Thomson recording wattmeter be used on alternating-current circuits?

ANSWER

The Thomson recording watt-hour meters or any meters of this class working on the same principle can be operated equally well on either direct current or alternating current. This is because a reversal of line polarity reverses at the same time both the series and pressure circuits, and thus the relation of the currents in the field and armature circuits of the motor part of the meter is unchanged and the motor continues to revolve in the same direction. Reversal of both field and armature currents at the same instant without time lag is made possible because the motor contains no iron. For the same reason the polarity of the line terminals is immaterial when the meter is used on direct current.

The Wisconsin Geological and Natural History Survey has just issued a bulletin on the water-powers of Wisconsin, by Prof. Leonard S. Smith. This complete bulletin describes the fall in all the Wisconsin rivers and their important tributaries; also the location and extent of future reservoirs for conserving and regulating river flow. Of especial value are the compilations of all the data regarding run-off, collected by the United States Geological Survey during the last six years.

NEW SERIES OF NERNST LAMPS

The new Westinghouse Nernst lamp units now being manufactured by the Nernst Lamp Company represent the most marked improvements that have been made in the Nernst system since its introduction into America. There is scarcely a feature of the original lamp that has not been altered and improved. Mechanical construction has been simplified and strengthened; the question of renewal has been solved in a satisfactory manner, and efficiency has been greatly increased.

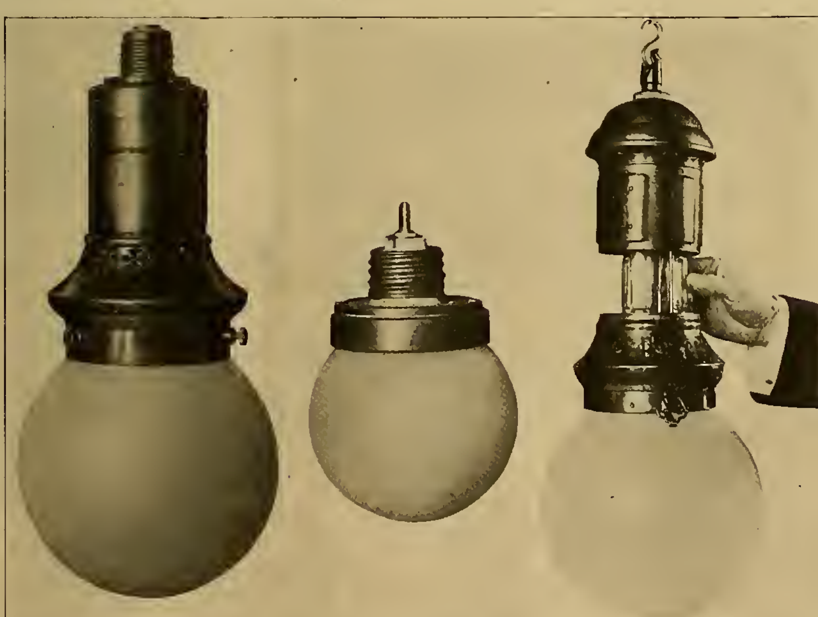
A large range of sizes, permitting uniform illumination throughout even the most complicated installations, has always been a distinctive feature of the Nernst system. The new series of units provides for still greater latitude in this direction offering, in addition to multiple-glower units, four convenient sizes of single-glower units, namely, 66, 88, 110 and 132 watts.

These four units are all equipped with screw burners, as shown in two of the accompanying illustrations, which combine the two most important features of the lamp, the glower and the heater, in a single piece, admitting of the utmost simplicity in renewal. The 132-watt unit gives a greater candlepower than the old two-glower lamp, thus adding a lamp of intermediate size to the screw-base class.

These lamps are made for both 110 and 220 volts alternating current and direct current. This fact, their desirable sizes and easy renewal make them suitable for domestic as well as commercial use. They are capable of any style of artistic treatment, either as single units or as clusters.

While the four single-glower lamps are provided with screw burners, the multiple glowers are equipped with improved prong holders, whose renewal is also greatly simplified. The heater, which is of the same pattern as that used in the single-glower lamps, is mounted on a porcelain wafer which can be removed or slipped into position without coming into contact with the glowers or interfering with them in the least.

All the glowers as now manufactured contain a new combination of rare earths, embracing three



Single-glower Lamp Complete — Screw Burner of Single-glower Lamp — Multiple-glower Lamp Showing Accessibility of Ballast

NEW WESTINGHOUSE NERNST LAMPS

new ones whose properties have lately been discovered. Through this construction an increase in the glower efficiency of various units amounting to about 33⅓ per cent., is attained.

The new multiple-glower units represent important changes in mechanical design throughout. The lamp body is of a new design, which embraces a cap that conceals the terminal posts. Besides being equipped with a hook as formerly, it is furnished in several different fixture combinations, making artistic pipe and chain pendants with canopies a part of the lamp.

In the new lamps the ballast is larger and of such rugged construction as to be capable of withstanding heavy voltage fluctuation. As shown in the illustration, the construction of the lamp body makes it easy of access, and a bayonet spring base makes replacement extremely simple. A new type of globe holder protects the glassware from breakage and facilitates trimming. The glowers operate at 0.6 ampere instead of 0.4 ampere, thus requiring less handling for equal consumption of current. They are made tubular instead of solid.

The new three-glower unit gives the same candlepower for 396 watts as the old six-glower unit for 528 watts. It requires but one wafer heater and three glowers, while the old required four heaters and six glowers. This not only means a saving in cost of renewals, but a great saving in the time of the attendant.

No reflecting glassware is required with any of these units, which means a great saving in comparison with units whose efficiency is attained through the use of reflectors.

WOODPECKERS DESTROY POLES

Birds are destroying telephone and telegraph poles in the South and Southwest, particularly in Texas, Arizona and California. In some places 50 per cent. of all the poles along the right-of-way have been riddled by these innocent offenders which belong to the woodpecker family.

One of the Western Union officials, who has recently returned from an inspection through the West, reported having seen 25 telephone poles with 200 or 300 holes drilled clear through them. Some of the holes were three or four inches in diameter.

An officer of the Illinois Central Railroad counted the white cedar telephone poles along the right-of-way near Covington, Tenn., which had been affected by woodpeckers, and found that out of 268 poles 110, or 41 per cent., had been bored.

In some cases destruction of the pole takes only a few months, and the weakened condition of the pole makes it dangerous for a lineman to climb it.

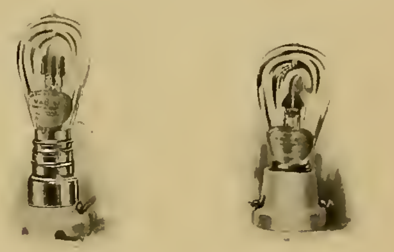
Many methods for preventing this damage have been suggested, but probably the most successful is preservation with creosote. A line of creosoted poles opposite the one near Covington was examined and not a single hole was found. When it is considered that creosote will not only prevent the damage caused by the woodpecker but also protect the pole indefinitely against both insects and decay, its great value as a preservative is apparent.

The Forest Service of the United States government has spent considerable time in developing a cheap yet efficient method for the treatment of telephone and telegraph poles. The results of the work are embodied in several Forest Service circulars, copies of which may be obtained without cost from the Forester, Washington, D. C.

A VACUUM LIGHTNING ARRESTER

As is well known, a partial vacuum presents an easy path for the discharge of electricity of high potential through the familiar phenomenon of the Geissler tube, and at the same time is an effective resistance to the passage of low-tension telephone, telegraph or signaling currents. A lightning arrester utilizing this principle is the invention of a practical telephone man, and under the trade name of the "Vac-M" arrester is manufactured by the Michigan Electric Specialty Company, 73 West Western Avenue, Muskegon, Mich.

The arrester consists of a glass globe similar in form to the ordinary incandescent bulb, from which the air is extracted to produce a partial vacuum. Electrodes mounted in the globe are separated by a distance less than one-eighth inch and connecting wires lead to outside terminals. The grounded-circuit arrester has two electrodes to be connected



For Metallic Circuits — For Grounded Circuits

A VACUUM LIGHTNING ARRESTER

to line and ground, respectively. The metallic circuit arrester with its three electrodes has the middle one for the ground connection, the outside pair leading to the line wires.

The Vac-M lightning arrester, by reason of the discharge through the vacuum, effects a steady passage of the abnormal voltage and gives no opportunity for the potential to pile up as would be necessary in case an air-gap were to be bridged. The arrester discharges steadily as long as the unusual potential exists, without noise and with no exposed arc or flame. The latter advantages will commend this arrester for use in dwellings where telephone lightning protection must be installed. Instances in which this arrester was installed, quoted by the manufacturer, show that during severe electrical storms, in which the wires of farm lines were destroyed, houses damaged and fuses blown, not a single telephone instrument protected by the Vac-M arrester was injured.

ELECTRICAL CONDITIONS IN OMAHA

In Omaha the city charter requires the mayor to appoint, subject to the approval of the City Council, a practical electrical engineer as city electrician. The duties of the city electrician are to supervise and inspect all inside and outside wiring and apparatus, inspect gas and electric street lights, supervise the fire-alarm and police telegraph systems, read electric meters in public buildings and attend to all fires. He has complete control of the department and appoints his assistants, subject to the approval of the City Council. Mr. Waldemar Michaelsen, the present city electrician, was appointed in 1906 for a three-year term, having previously served two years of an unexpired term.

Before any inside wiring may be installed, altered or added to, an application must be filed with the city electrician and a permit obtained. The 1905 National Electrical Code, with a number of special and valuable rulings, is at present in force. All electrical wiring and apparatus is required to be inspected during the course of installation and after completion, and, if satisfactory, a certificate of approval issued. It is unlawful to supply current to an equipment previous to the issuance of the certificate or to a condemned installation. All outside overhead and underground wiring and apparatus is required to be inspected annually and all unsafe installations made safe. Outside wires, except trolley wires, street-railway feeders and wires used for clocks, burglar alarms, night-watch and messenger-call service, are required to be placed underground in practically all of the congested-value district. Distribution poles are permitted in block interiors. Telephone and telegraph wires are not permitted to be run in a conduit or through a manhole containing wires or apparatus carrying current for light, heat or power. Contractors are examined, licensed and bonded, but wiremen are not.

The Omaha and Council Bluffs Street Railway Company transmits 13,000-volt, three-phase current from its main power plant to a sub-station through an underground transmission line; also distributes from the main power plant and the sub-station 550-volt direct current (ground return) for street-railway purposes and 550-volt direct current (complete metallic circuit) for commercial power purposes. The Omaha Electric Light and Power Company provides the following: 2,300-volt, three-phase alternating current, stepped down to 166-212 volts and 220-440 volts; 500-volt direct current (complete metallic circuit); 2,000 to 8,000-volt, three-phase alternating current for series street arc lighting. The following-named companies maintain low-tension or signaling systems: Western Union Telegraph Company, Postal Telegraph-cable Company, American District Telegraph Company, Nebraska Telephone Company, Independent Telephone Company and municipal fire-alarm and police signaling systems.

A NEW TESTING WATTMETER

Periodical meter calibration is of great importance, of course, to every central station or isolated plant. Although the customary method of testing with indicating instruments is quite accurate, the rapid growth of the lighting and power industry has necessitated a demand for a meter with which these tests could be made more quickly and still retain the same high degree of accuracy. To meet the demand for this type of meter the General Electric Company has just placed on the market the Thomson direct-current test meter, which is known as the type "CB."

As may be seen by referring to the illustration, the meter is enclosed in a substantial carrying case of quarter-sawed oak with an antique finish and, owing to its small size, is very convenient to handle. The entire meter can be lifted from the case by two buttons on opposite sides, thus making it easily accessible for calibration, and when removed from the case will remain without support in an upright position. The register is large and its location on the top of the meter enables the indications to be easily read. This feature is particularly advantageous when making tests in places where there is no opportunity to place the meter close at hand and it must be set on the floor or some other place below the observer.

The register is of the three-pointer type. The largest pointer indicates directly on the dial, the disk revolutions. This dial can be read to hundredths of a revolution. The two smaller pointers make one revolution, respectively, for each 10 or 100 revolutions of the large pointer. It is, therefore, a simple matter to ascertain the number of revolutions of the disk by noting the position of the three pointers at the start and finish of each test.

In order that low friction be maintained for a long period, it is necessary that the pivot and jewel be of the hardest possible material, and to this end the cup-diamond jewel has been adapted for the lower thrust bearing in this type of meter. The pivot in the shaft end is drawn from the highest grade wire, glass-hardened and highly polished.

This type of meter is furnished in two distinct

PORTABLE TEST METER

ratings, 1-2-10-20-40 amperes or 5-10-50-100 amperes, each with single 110-volt or double 110-220-volt potential windings, as may be desired. This latter form is particularly desirable for stations having the Edison three-wire system of distribution. The potential winding is suitable for use on voltages ranging 10 per cent. on either side of normal.

The 1-2-10-20-40-ampere meter has two current windings, one divided in two sections, the other in four sections. By means of plugs and connection straps, these windings may be connected in series or multiple, giving the five different current capacities. This same method is followed in the 5-10-50-100-ampere meter. With any one of the combinations, the torque developed is the same provided the meter operates at the same per cent. of full load. In other words, when using the one-ampere winding with one ampere flowing, the torque is the same as that developed by the 40-ampere combination with 40 amperes flowing. This feature is valuable, as the test meter is never operating under light-load conditions, thus eliminating any possible inaccuracies which might occur if it were operated at extremely light loads.

The five separate windings of the 1-2-11-20-40-ampere meter render it possible to obtain accurate registration from a 10-watt load to a four-kilowatt load. It is said that under all conditions in central-station practice the accuracy of the Thomson direct-current test meter is exceptional.

ELECTRICAL DEFINITIONS

The British committee of the International Electrotechnical Commission is now engaged on the compilation of a series of definitions of expressions used in electrical engineering, the object being to arrive at a common understanding in this matter in order to avoid different expressions for the same meaning being used by various people. How far this will meet with general approval it is difficult to say, as the series has, as yet, only reached as far as the letter G; but already there are some signs of dissent in England. The sub-committee which has had charge of this task is thoroughly representative of all branches of the art in Great Britain; it includes electrical engineers, scientists and contractors. In effect, the result seems to be an official glossary, but its main object is to secure uniformity, which, in many directions, is at present conspicuous by its absence.

A GREAT INTERURBAN SYSTEM

For the year 1907 the Illinois Traction System reports gross earnings of $3,779,187, compared with $3,013,107 for 1906. The largest item of earnings is $1,610,257 from interurban service, which was $1,088,134 in 1906. Next comes local street-railway service, $1,226,501; electric light and power, $542,032; gas, $259,572, and steam heating, $127,453. All of these items show increases over the corresponding figures for 1906. Total operating expenses, including taxes, were $2,128,487, leaving net earnings of $1,650,699. After deducting bond interest and preferred-stock dividends the remaining surplus income was $453,115. The company operates a great electric-railway system connecting Danville, Champaign, Bloomington, Decatur, Peoria, Springfield, Ill., and St. Louis, Mo.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, August 7.—A short section of the suspended electric road which it is proposed to run in Berlin has been completed. It is not intended for running the cars, but is designed to show the conditions of erecting the structure in the middle of the streets, as well as its general appearance. Before deciding finally to build the electric line it must be approved by the property owners and other persons interested. The trial section lies not far from the Rosenthal Gate. While using the general type of suspended car, such as is now running on the Elberfeld-Barmen line, the new road will differ considerably from the latter. The cars are hung upon a rail which lies at each side of an elevated platform or framework, and this is upheld by a series of iron beams planted in the ground about 45 feet apart.

It is proposed to mount the motor and the main part of the outfit upon the roof of the car, where it can be reached conveniently. All the cars are to be motor cars, without using trailers. The road will run through the city and return, so as to make a continuous loop, and this will facilitate the service and allow of running the trains at frequent intervals. The cost is only one-third of that of a subway. In general, the subways in Berlin run from east to west, but the new electric line will take a north-south course and thus cover other districts.

Not long since the construction of the new radio-telegraph station at the Eiffel Tower was commenced. It will be remembered that the project of a high power plant was approved by the French government. It will be in charge of the War and the Navy departments, who are now jointly engaged in its construction. It is expected that the new station will be one of the most powerful which exists, and will signal to New York and undoubtedly much farther, as this is the first time that such a high mast (1,000 feet) has been used. The station will be entirely underground, and its presence will be revealed only by the four masonry towers which are placed in the middle of the gardens of the Champs de Mars, in order to hold the mast wires coming from the top of the tower.

The steepest grade for a cable incline has been reached in the construction of the line which connects the elevated terrace of Virgl with the station of Bozen, in the Tyrol. This locality lies on the Eisach River. While the Mendel incline has a 64 per cent. grade and the Vesuvius line 63 per cent., there is at Bozen a 70 per cent. slope in the steepest parts, and the remainder is 66 per cent. Such grades were necessary from the formation of the mountain side, which is of a precipitous character. A three-phase motor of 60 horsepower drives the cable drum, and the plant is located on the terrace. Current is supplied from the central station of Zwölfmalgreien and the pole line is operated at 3,450 volts. At the cable line a transformer post reduces the voltage to 550 volts for the motor. The brakes will stop the cars in a distance of 1.2 meters.

The minister of the marine has decided that the battleship Verité, which carried President Fallières on board during his trip to Scandinavia, and the armored cruiser Léon Gambetta, one of the vessels which figured in the recent Quebec celebration, should be equipped with microphonic receivers in order to take the sound signals sent under water by bells arranged for the purpose. It has been decided also that a signal bell shall be mounted temporarily upon a smaller vessel which has apparatus for operating the bell. The results of the trial will be announced shortly.

The French government is taking an active interest in the trial of electric locomotives upon a standard-gauge line running from St. Georges de Commiers to La Mure. The use of electric trains will be welcomed by the tourists who frequent this picturesque region. It is possible that the line may be extended. The minister of public works was present at the recent tests of the locomotives.

A. de C.

GREAT BRITAIN

London, August 7.—A Swiss invention for making hollow concrete poles for telegraphic, telephonic and power-transmission purposes is now being worked in this country. In making these poles the concrete, which is mixed very dry, is applied around a core of sheet-iron and a pressure of 5,000 pounds applied. The system of manufacture involves the use of a conveyor belt and webbing which, while applying the pressure named to the concrete, at the same time embeds longitudinally wire rods into it, after which wire is wound around the outside spirally. Such reinforced poles are said to have been used to a large extent upon the Continent, and the prices quoted under the new system are some 60 per cent. cheaper than the ordinary poles which have been used hitherto.

Two interesting examples of municipal electrical trading are just now the topic of some conversation. At West Ham, where the corporation has certainly catered for the power load in a very energetic manner, a Local Government Board inquiry was begun last week, when the ratepayers' association asked for some figures with regard to contracts for power supply which have been entered into. These were refused, and the inquiry was adjourned without date. The opponents to the proposed loan assert that many contracts have been entered into at an unremunerative price, while, on the other hand, the corporation says that the firms with whom these contracts have been entered into disapprove of their being made public. Until the figures asked for are forthcoming, no further capital expenditure will be authorized by the Local Government Board, but, being a statutory undertaking, the corporation must carry it on. The procedure, therefore, will be that the corporation bankers will allow overdrafts, and probably at some future time the Local Government Board will be forced to sanction what is known as excess expenditure.

The other case is at Wigan, where a Local Government Board inquiry was commenced in 1906 and adjourned in a similar manner for the production of certain figures. In the meantime bankers' overdrafts have enabled the undertaking to be carried on, and last week sanction was given to this excess expenditure.

Since the Dundee Corporation sent a deputation to the Continent to investigate the possibilities of trolley omnibuses, this method of electric traction is being taken quite seriously in many quarters. I have already reported that Sheffield regards it with a favorable eye, but the Manchester Corporation has gone one better and is to send a deputation consisting of two committeemen and two officials on a tour of inspection on the Continent. The question of street widenings assumes increasing importance, as the tramway systems in large towns are extended toward the outskirts, and the trolley omnibus is looked upon as affording a means of avoiding large capital expenditure upon such widenings.

An electrically driven barge lift was opened in Cheshire last week. This is at Anderton, where the river Weaver passes the Trent and Mersey Canal, which runs on a level 50 feet above. For over 30 years the lift in question has been worked by hydraulic power, but four years ago it was decided to reconstruct it for electrical working at a cost of $125,000. The work has occupied 2½ years. Current is taken from the local electric supply company. The principle of working the lift, which has not been altered, is that the barges are raised or lowered in a trough of water, two troughs being used, working in opposite directions, and so assisting each other. These were formerly worked by hydraulic rams. As the troughs balance each other, it will be seen that the amount of electric power required is comparatively small, and although a 30-horsepower motor has been installed, there is a very large margin of power in case of possible inequalities of load due to different levels of water in the two troughs. G.

NEW YORK

New York City, August 15.—The matter of the purchase by the city of the Belmont tunnel is to be brought up again before the Board of Estimate and it is confidently expected that the measure providing for the purchase will be passed. It will then remain to be seen what the Public Service Commission will do, as the consent of that body is necessary. In the meanwhile the Interborough company, which owns the tunnel, is working steadily on the connections between the tunnel and the lines of the Queens County Railroad, the Belmont surface lines out of Long Island City. In the event of the city taking over the tunnel it is expected that the Interborough company will operate it, and cars be run direct over the Queens County lines into the tunnel and under the river to Manhattan.

A Manhattan taxpayer has brought in an application for an injunction restraining Fire Commissioner Hayes from permitting the Manhattan Fire Alarm Company to connect its private customers by private wire with the fire-alarm boxes in the street. It is stated that the permits constituted a valuable franchise for which the Fire Alarm Company should pay, whereas it was now enjoying the privilege without compensating the city.

A waiterless restaurant which is to be erected on the site of the old Hotel Saranac, in the Times Square section, on Broadway, will contain many unique electrical features. An entire eight-story building will be devoted to the purpose, and it is said that nothing in the city approaches the elaborate designs made for this restaurant. Electric elevators and carriers will take the places of waiters and serve food hot from the kitchens in response to orders transmitted from the diners by a telautograph system. The automatic tables will be on the second-floor restaurant, which will be the main room. This floor will be built with a sub-chamber in which the waiters will work and spread the tables. Guests will not give verbal orders to the waiters, but will write on automatic pads what they want, and instantaneously these orders will be reproduced in the kitchen. This will save time, and when the order is ready the waiter will take his stand in the sub-chamber. Not the entire table, but the inner part of the table will be lowered, leaving the rim before the guests. The segment of the table will then be spread with the desired food and ascend to the guests.

A joint fare is likely to be the result of the transfer fight between the Metropolitan Street Railway Company and the Central Park, North and East River Railroad Company. At the same time it is hardly probable that the combined fare will be as low as five cents, and it is expected that passengers will be called on for an extra cent or two. The receivers for the Metropolitan contend that inasmuch as the transferring passengers travel a much greater distance on their lines than on the crosstown line, they should receive close to four cents and the crosstown concern but little more than one cent. This will meet with opposition from the latter company, which will hold out for 2½ cents out of every five cents.

The Public Service Commission in the Second District has dismissed the application of the receiver of the Tarrytown, White Plains and Mamaroneck Railroad Company, to increase the rate of fare between White Plains and Mamaroneck from 5 to 10 cents. In announcing the decision, Chairman Stevens said that it was the duty of the commission to order the enforcement of the terms of the franchises and not to disregard them.

The Edison Electric Illuminating Company of Brooklyn tendered its annual dinner to the electrical contractors of the borough Tuesday evening, August 4th. The banquet was held at Coney Island and 200 guests were present. W. W. Freeman, vice-president and general manager of the company, presided as toastmaster, and addresses were made by T. C. Martin, C. A. Christensen and A. S. Beach. In his address of welcome Mr. Freeman drew attention to the increase in business the company had enjoyed, comparing the figures for the lamps required the last two years. A social organization of electrical contractors, known as the Kilowatt Club, is to be formed shortly and plans for the new organization were discussed at the dinner. W.

NEW ENGLAND

Boston, August 15.—Negotiations for transfer of control of the Atlantic Shore Line Electric Railway Company are pending. The general offices of the road are at Sanford, Me., and it operates 97 miles of road along the coast between Portsmouth, N. H., and Portland, Me. It has $3,000,000 stock outstanding and a funded debt of $2,700,000. Ernest M. Goodall is president and E. B. Kirk general manager. The principal security holders are A. H. Bickmore & Co. of New York, and they had a party of American and French capitalists as their guests at Sanford on Thursday and Friday inspecting the various lines and two power plants.

N. L. Amster of this city has purchased the controlling interest in the electric-light company of Globe, Ariz., which is capitalized for $200,000 and is said to earn about $30,000 net per year.

The activity of American Telephone stock on the New York exchange within a short time leads to the belief that New York interests are desirous of obtaining a definitely larger share in its management, although some of the buying, of course, is purely speculative, on account of the splendid showing in a business way which the company continues to make. American Telephone stock hitherto has been largely a Massachusetts investors' specialty. At the close of 1907, of the 1,525,280 shares of American Telephone stock outstanding about 80 per cent. was owned in New England, and of the 23,500 stockholders of record 18,000 approximately were residents of Massachusetts. The stock has recovered upward of 30 points from its low level of last year as a result of the active demand for it in both investment and speculative trading.

The Bristol and Plainville Tramway Company, a 14-mile electric railway in Connecticut, has just declared a 50 per cent. stock dividend, which is something unique in the recent annals of street railways of New England. The company operates the electric-light and gas plants of Bristol. The authorized capital is $1,000,000, but only $250,000 had been issued. The new output increases the amount to $375,000. It has paid six per cent. annually since it started in 1895, and had a surplus accumulated at the close of the fiscal year ending June 30, 1907, of $112,563, having added $22,890 for that year alone. For the year ending June 30, 1908, the surplus increased sufficiently to permit of the stock dividend of $125,000. Last year the road carried close to 2,000,000 passengers. When outside parties tried to secure control of the road for the New Haven system two years ago enough stockholders pooled their holdings to block the scheme. Miles Lewis Peck is the president of the road.

Lightning struck the distribution station of the Bangor Railway and Electric Company August 13th, burned out the switchboard and temporarily paralyzed the railway and power service. B.

SOUTHEASTERN STATES

Charlotte, N. C., August 15.—Further information relative to the incorporation of the Carolina Power and Light Company is that the new concern will represent a merger of the Raleigh Electric Company, controlling the railways and lighting systems of Raleigh; the Central Carolina Power Company, engaged in developing a large waterpower at Buckhorn Falls, and the Consumers' Light and Power Company of Sanford, N. C. The new company began its existence August 1st, with Charles E. Johnson of Raleigh, president, H. H. Dalton of New York, secretary and treasurer, and H. H. Carr, Raleigh, general manager. The Carolina company will construct the necessary transmission lines for its interests in Raleigh, where the local street-car system will be improved, and will also run lines to Sanford and Fayetteville, where cotton manufacturing plants will be supplied with power. The company is one of the largest in the state. Power from Buckhorn will be brought to Raleigh by December 1st, it is expected.

Receivers of the Cape Fear Power Company having filed their final report with Judge T. R. Purnell of Raleigh, N. C., the receivership was continued temporarily at the request of council for the Metropolitan Trust Company of New York. The company's plant was sold to the bondholders for $180,000, and a large number of suits, brought on account of alleged damages from overflow, have been settled.

A local telephone fight of some interest is on at High Point, N. C., where the Home Telephone Company has petitioned the corporation commission to compel the Bell company to charge for its service from August 1st, alleging that the Bell people have completed their system in that town, while the Home company, it is understood, further alleges that the Bell company has signified its purpose to make no charges before October 1st, asserting that the system will not be completed before that time. L.

EASTERN CANADA

Ottawa, August 15.—The Bell Telephone Company of Canada has embarked upon a plan of extensive improvements to its system throughout Ontario and Quebec. The work, when completed, will cost no less than $1,000,000, and will place the company in a position to handle its rapidly increasing business in these two provinces satisfactorily.

With at least two Independent companies contesting the field against the Bell Telephone Company, the telephone situation is decidedly active in certain sections of Ontario. The opposing companies are pushing ahead into new territory, and, if present conditions continue, the time is not far distant when telephone communication will exist between practically every farm house in the province. While the Bell company is not extending its own lines into the rural sections, to any great extent, it is nevertheless fighting its opponents by inducing rural sections to use the privilege of forming associations and building farmers' lines with Bell telephone connection.

There is a revival of the project for the construction of an electric railway from Dunnville, Ont., across the Niagara Peninsula. The president of the company which holds the franchise of the proposed road has received assurance that George Dunstan of Toronto and P. T. McGrath of Worcester, Mass., will finance the undertaking.

Mr. William Mackenzie successfully floated, in London, England, the $2,500,000 of the Toronto Power Company's bonds. The bonds were guaranteed by the Toronto and York Radial Railway companies and were issued to provide for the interest of the Electrical Development Company of Ontario, as was outlined when the control of that company was secured by Mr. Mackenzie. W.

WESTERN CANADA

Winnipeg, August 15.—August 14th was the date of closing bids for the $600,000 power debentures of the city of Winnipeg, Man. By that day no tenders had been received, so further action will be discussed at a special meeting of the power committee, to be held soon.

Sealed tenders will be received by S. P. Porter, deputy commissioner of telephones and railways, Regina, Sask., until August 25th for the construction and installation of the Regina, Arcola and Antler long-distance telephone line. This is one of the longest lines to be constructed by the Saskatchewan government. Raymond R. Houghton, secretary-treasurer, Belmont, Man., will receive sealed tenders until August 29th for the construction and installation of a rural telephone system throughout the municipality of Strathcona, Man. Plans and specifications may be seen at the municipal offices at Belmont, Man., and also at the offices of the Manitoba Telephone Commission, Winnipeg, Man. A. P. Power, secretary-treasurer, Virden, Man., will receive sealed tenders until August 31st for the construction and installation of a complete telephone system for the municipality of Pipestone, Man. Plans and specifications may be seen at the municipal offices at Virden and also at the offices of the Manitoba Telephone Commission, Winnipeg, Man.

Complications have already arisen over the transfer to Fort William of that portion of the Port

Arthur municipal electric street-railway system running in Fort William. Fort William has appointed two commissioners to consult with two commissioners from Port Arthur, but the latter city refuses to make any appointments for this purpose, asserting that the lease is sufficiently clear as to all details and that Port Arthur has full control of operation for the next five years.

The ratepayers of Wetaskiwin, Alberta, carried the by-law providing for an expenditure of $12,000 for improving the electric-lighting plant. Mayor McKay may be addressed.

The Manitoba Telephone Commission is building a line to Hannah, N. D., where connections will be made with two American lines. This will be the third line connecting the Manitoba system with systems south of the international boundary.

S. Edwards, superintendent of the government telephone system in Alberta, has resigned on account of ill health. He will make his future residence at Winnipeg, Man.

The City Council of Edmonton, Alb., has secured the charter of the Strathcona Radial Tramway Company, which proposes to install an electric street-railway system across the river in Strathcona. Mayor Macdougall, Edmonton, is now completing arrangements for the construction of a street-railway system to serve the two cities, and it is expected tenders will be called at once for the construction of the system. R.

OHIO

Toledo, August 15.—A large electric sign has been erected on the roof of the new 10-story Hotel Secor at Toledo, which can be seen for many miles. The sign contains the words "Secor Hotel, Fireproof." The framework is of steel, 30 feet high and 25 feet wide. The letters in the line "Secor Hotel" are five feet in height, while those in the word "Fireproof" are four feet high. There are more than 300 incandescent lights in the sign. It is the intention to erect another sign of equal size on the opposite corner of the building.

Warren J. Bicknell of Cleveland has been elected chairman of the board of directors of the Toledo Railways and Light Company, and will act in an advisory capacity to President Lang. He has formally entered upon his new work in connection with the examination of the property by Ford, Bacon & Davis, expert railway engineers and accountants. Mr. Bicknell has established an office in the Smith & Baker Building.

Superintendent Herman Gamper of the Columbus electric-light plant has notified the electrical supply houses of that city that unless they change their business tactics he will place the whole matter in the hands of the prosecuting attorney on the ground that they are violating the Valentine anti-trust law of Ohio. He asserts that when he has advertised for bids for electrical supplies all the dealers in the city priced the same article at the same figure, which was considerably higher than the articles could be purchased for in the open market. He further asserts that when he threatened to go outside to make purchases he was met by threats of political influence.

One of the first districts to avail itself of the benefits of the new Hillenkamp law, passed by the recent Legislature of Ohio, will be the West Toledo district which lies outside of the corporate limits. This law permits the trustees of a township to enter into contracts for the illumination of streets of an unincorporated district. A petition signed by a large majority of owners of property abutting on the streets to be lighted has been presented to the trustees of Washington Township.

This was a big day at Lima, the state convention of the Ancient Order of Hibernians being in convention there. In honor of the event the city was decorated with electricity, the public square being decked with electric harps and festoons of electric lights.

Yoshio Shinjo, a Japanese electrical engineer, was in Toledo, Ohio, this week inspecting the power plant of the Toledo Railways and Light Company. Shinjo is a government agent from Tokio, and is on a tour of the world obtaining information concerning the use of electricity in this and other countries. S.

ILLINOIS

Peoria, August 15.—Chandlerville will have an election to lay the matter of an electric-light plant for the city before the people. The estimated cos. is $5,000.

The St. Charles Fixture Manufacturing Company has been incorporated with a capital of $85,000 to do a general manufacturing business at St. Charles. The incorporators are J. B. Horne, J. G. Tapper and C. F. O'Hara.

Manager Nelson of the Peoria Railway Company has returned from a long automobile trip through Indiana and Ohio, covering a distance of over a thousand miles.

Another interurban is being projected to connect the tri-cities Rock Island, Moline and Davenport with Peoria, coming through Coal Valley, Cambridge, Orion, Andover and Kewanee. Investigation of the line shows that there are in the five-mile strip an average of 1,116 persons per mile, while the average along interurbans is 750 persons per mile. At Kewanee connections may be made with the road to Galva, that in time will be extended to Galesburg.

Negotiations have been completed for the financing of the Alton, Jacksonville and Peoria Railway line from Alton to Jerseyville and from there to Jacksonville. A foreign syndicate has agreed to take the bond issue of the company. The line is now being operated from Alton to Godfrey, and so far has been financed by Alton and Jerseyville capital. It is announced that the building of the new line will be pushed at once. V. N.

INDIANA

Indianapolis, August 15.—The Dinwiddie and Gary Railway Company has filed articles of incorporation with the secretary of state for capitalization at $80,000. The company proposes to construct and operate 20 miles of railway in Lake County. Benjamin J. Gifford, Oscar Dinwiddie and Frank E. Lewis are the directors.

The Grant County commissioners have granted a franchise to the Elwood and Swayzee Traction Company, incorporated last week, to construct and operate a gasoline-electric traction line through the county. The promoters of the road declare that work will begin at once, and that cars will be running by Christmas.

The election held in Center Township and in Ross Township, Clinton County, to vote on a proposition of giving $50,000 and $15,000, respectively, in aid of the construction of the Frankfort and Delphi traction line resulted in a defeat in both townships. There were two causes for the lack of approval of such a subsidy tax—first, because the townships have already been heavily taxed for like purposes, and second, the general belief that the road would be built without such assistance.

A petition containing 3,000 signatures of residents of Goshen, Warsaw, Milford, Leesburg, New Paris and other points along the Winona Interurban Railroad, asking for Sunday service over the line has been presented to the officials of the company. The petitioners informed the officials that the petition was to be used in support of a bill for a receiver for the Winona Railway Company, now pending in the United States Circuit Court in Indianapolis.

The Indiana Railroad Commission has entered upon the work of compelling, as far as its authority extends, the separation of grades between traction and steam-railroad companies. The Indianapolis, Columbus and Southern Traction Company has been ordered to lower its grade beneath that of the Pennsylvania Railroad four miles south of Indianapolis.

Evansville was swept by the worst electrical storm in the history of the city last Monday. The electric-light and telephone service and the street-railway and interurban lines were all put out of operation.

The officials of several traction companies operating in Indiana disagree with William J. Wood of the Indiana Railroad Commission in the matter of the latter's ruling on interurban lines as express and baggage carriers. The ruling of Commissioner Wood, made for a Northern Indiana road, is that the baggage law applies with equal force to the interurban lines as well as to steam roads. The interurban officials deny this, and say the law containing the section which provides that roads do not have to carry baggage unless they have a special baggage car, was passed especially for the relief of traction lines. The Indiana roads carry hand baggage free, but make a charge of 25 cents for carrying trunks. It is likely that the question will be carried to the courts for a decision.

The City Council of Goshen has taken steps looking to the installation of a municipal electric-lighting plant and a new waterworks station.

The 16-hour law passed by the last Indiana Legislature applies to interurban lines as well as to steam railroads operating in Indiana, as construed by the Indiana Railroad Commission. The law in effect provides that railroad companies shall not permit an employe to remain on duty more than 16 consecutive hours. The Commission holds that the law includes both those connected with steam and electric lines, and that there is nothing in the language of the statute contrary to the idea that it was intended to apply alike to all roads.

The Central Union Telephone Company is reported to have made a proposition to the Fort Wayne Home Telephone Company for a unification or working agreement between the two companies. The Central Union proposes to abandon its local service in consideration of securing the toll-line business of the Home company to points not now reached by the Independent long-distance line. The agents of the Central Union Telephone Company say that it is the purpose of the Bell to sell out wherever the Independents are strongest, and to gain control where they are in the ascendancy. They are advocating a single telephone system in each town and city where such a plan can possibly be accomplished. The Central Union company is stringing two lines from Seymour to Indianapolis to be used by the Mutual Telephone Company, an outgrowth of the recent telephone war at Seymour. The Mutual Telephone Company will remain independent but use the Central Union telephone wires to talk direct to Indianapolis.

According to figures recently granted by the Indiana State Bureau of Statistics, municipal ownership made a gain of three street-lighting plants in 1907 over 1906. In 1906 there were 51 privately owned plants, 34 municipal plants and one leased plant. In 1907 there were the same number of private plants and 37 municipal plants. As shown by the figures, the percentage of municipally-owned waterworks in Indiana is much greater than the percentage of municipal lighting plants. S. S.

NORTHWESTERN STATES

Minneapolis, August 15.—A company with a capital stock of $1,000,000 is reported organized at Treynor, Iowa, to construct a combination steam and electric railroad between Council Bluffs and Des Moines, Iowa. Peter Kaghmann of Treynor is secretary.

A new interurban electric road is planned between Council Bluffs and Sioux City, Iowa, passing through Little Sioux, Magnolia, Logan, Beebeetown and Crescent. W. S. Cook is promoting the enterprise.

It is proposed to construct an electric line from Marshalltown, Iowa, north to Charles City. Six hundred thousand dollars will be required.

The American Automatic Fender Company of Minneapolis has been incorporated for $500,000 and a subsidiary company with a capital of $250,000 has also been launched at Los Angeles, Cal. The company will manufacture a fender designed by F. A. Nelson.

The Royalton Power and Light Company of Royalton, Minn., has been incorporated to develop the power recently employed by the Gregory-Bliss Company. The capital stock is $10,000. C. R. Rhoda is secretary and treasurer of the power company.

Before making improvements at the electric-light and pumping station at St. Cloud, Minn., the Osakis Milling Company has asked the council for a 10-year franchise from September 1st.

The Electric Short Line Railroad Company of Minneapolis was incorporated for $50,000. Frank E. Reed, Glencoe, Minn., is secretary. While the route of the road is not given, it is surmised it will connect Minneapolis and Sioux Falls, S. D., by way of Glencoe, Minn.

The Minneapolis General Electric Company of Minneapolis has commenced an action in the Federal Court against the city for the collection of over $113,000, which it claims is owed for the lighting of streets, public buildings and public grounds. The suit arises over the refusal of the company to accept the rates as provided by a recent city ordinance and has been taken to the courts for the purpose of determining whether the city has or has not the right to establish rates.

The Kearney Water and Electric Power Company of Kearney, Neb., has been organized with a capital of $310,000 for the purpose of purchasing the Kearney Canal and the electric power plant and operating these properties under one management. Extensive repairs and improvements will be made at the power house. Will J. Scott is secretary.

A new franchise for the street-railway company at Grand Forks, N. D., is being considered. The material differences between it and the one the company wants nullified are: The city is asked to maintain the bridges; the abolishing of the provision for six-for-a-quarter fares, and the company's responsibility for electrolysis is broadened while the city's liability is lessened.

The Aberdeen Street Railway Company of Aberdeen, S. D., has been incorporated by Charles T. McCoy and others for $250,000.

The Huron Street Railway Company of Huron, S. D., has been incorporated for $50,000. John W. Smith heads the incorporators.

C. A. Kraynik, a machinist of Racine, Wis., has invented a safety hanger for a trolley wire which, when a wire breaks or sags beyond a safe distance from the ground, disconnects the current.

E. H. Martin of Webster City, Iowa, has applied on behalf of the Farmers and Merchants' Telephone Company for a franchise to occupy the streets of Marshalltown, Iowa. If granted the company will install a complete automatic system, laying 300 miles of underground conduits. It is planning to construct a $20,000 building for an exchange.

The Long Grove Telephone Company of Long Grove, Iowa, George B. Maxwell, secretary and treasurer, has increased its capital stock to $10,000.

The Bloomfield Telephone Company of Bloomfield, Iowa, was incorporated for $20,000, with W. J. Steckel as secretary and treasurer. It will take over the old Davis Telephone Company and expend $7,000 to $8,000 in repairs and new equipment. R.

PACIFIC SLOPE

San Francisco, August 13.—Though large projects in the power and transmission field are not very numerous just now, there are indications that a number of important plants will be up for consideration before long. Waterpower locations continue to be filed in various parts of the coast district and a number of municipalities are getting ready to act. The Kings River Power Company of Los Angeles has filed a claim to 40,000 miners' inches of water in Kings River, to be taken out in Fresno County; James O'Brien has appropriated 5,000 inches from the waters of the Cosumnes River, to be diverted near Georgetown; Louisa F. Scioron, 500 inches from Camp Creek; F. M. Cowell, 50,000 inches from the Stanislaus River, to be diverted near San Andreas, and B. Cusick, 8,000 inches from Deer Creek, to be diverted near Red Bluff.

The Great Western Power Company is now meeting with some delays in the construction of its high-tension power line from Big Bend on the Feather River to San Francisco Bay. The non-arrival of structural material from the East has caused the work on the tower line to be curtailed. Near Oakland, at the San Francisco Bay terminus of the line, the work has been checked by difficulties in getting rights-of-way and a number of law suits may be necessitated.

The Sacramento Electric, Gas and Railway Company, controlled by the Pacific Gas and Electric Company, has decided to appeal from the Superior Court of Sacramento County in the matter of water rights at Folsom, Cal., which have been awarded to the state of California by the lower court.

The town of Gridley, Cal., is now offering for sale bonds to the amount of $33,000, the proceeds of which will be devoted to the construction of electric-light and water plants.

The Board of Supervisors of Stanislaus County, Cal., has accepted the bid of the La Grange Mining and Power Company of La Grange, Cal., for a power-line franchise over the roads of the county between the Stanislaus, Merced and Tuolumne rivers.

The Edison Electric Company of Los Angeles, Cal., has issued a statement showing that its gross earnings for June, 1908, were $186,300; expenses, $112,910; net earnings, $73,390; fixed charges, $49,-915, and surplus, $23,474.

C. C. Hillis, general manager of the Electric Appliance Company, has returned to San Francisco from his eastern trip.

The California-Nevada Power Company has not yet taken over the hydro-electric interests of the Fleishhakers in Nevada, but it is understood that a 15 days' extension to the option has been secured.

The City Council of Ashland, Ore., has employed Frank C. Kelsey, an engineer, to make a preliminary survey of the proposed light and power plant and transmission line from Ashland Creek canyon.

The light and power plant of the Northern Pacific Company at Pasco, Wash., was destroyed by fire on August 7th. The loss is placed at $51,000, partly covered by insurance.

The Stevens County Light and Power Company has been incorporated in Spokane, Wash., with a capital stock of $100,000, by E. B. Bird, Horace R. Williams and F. D. Allen.

Bonds to the amount of $10,000 will be sold this week by the city authorities of Wenatchee, Wash., the proceeds to be devoted to the installation of an electric-light and power plant.

The Seattle Electric Company has been awarded a contract for furnishing electric current for lighting and power purposes for the Alaska-Yukon Exposition.

The Los Angeles and Redondo Railway Company of Redondo, Cal., has increased its capital stock from $500,000 to $5,000,000.

A. B. Merrihew, formerly chief inspector of the Los Angeles Railway, has been made general manager of the San Bernardino Valley Traction Company of San Bernardino, Cal.

The United Railroads of San Francisco has petitioned the Board of Supervisors of San Francisco for permission to withdraw its application for an electric-railway franchise on Sixteenth and Kansas streets and to have its $10,000 bond canceled.

F. M. Smith, who is backing the project to construct an electric railway from Oregon City, Ore., into the Beaver Creek, Molalla and Wilhoit Springs section of Clackmas County, Ore., has filed a notice of the appropriation of water from the Molalla River, near the junction of the north and south forks of that stream. He purposes the construction of a canal 25 feet wide at the bottom and 33 feet wide at the water's surface and to carry a depth of eight feet of water.

The Elk City, Lewiston and Spokane Electric Railway Company is being organized by men of Spokane, Wash., and Elk City and Lewiston, Idaho, for the purpose of connecting Elk City and Grangeville, Idaho, by an electric railroad. Stock to the amount of $200,000 has already been subscribed. The proposed line will be 35 miles long.

The judiciary and public utilities committee of the San Francisco Board of Supervisors has decided not to take any action in the efforts being made to contest the legality of the Home Telephone Company's franchise in San Francisco.

The City Electric Company, which commenced operations last October with two Westinghouse-Parsons turbo-generator sets of a combined capacity of about 5,000 kilowatts, has just started up a third similar unit with a capacity of 6,000 kilowatts at its station on the northern water front of San Francisco. A.

PERSONAL

Mr. Philip L. Spooner of Madison, Wis., has retired as president of the Southern Wisconsin Power Company and has disposed of his holdings to Magnus Swenson, by whom he is succeeded.

Mr. Alfred E. Braddell, formerly of the Philadelphia office of the Sprague Electric Company, has taken up permanent residence in Chicago, where he has charge of the conduit and supply department of the Sprague company's offices in the Fisher Building.

Mr. D. F. McGee, formerly manager of the Red Oak (Iowa) Electric Company, is now manager of the Astoria (Ore.) Electric Company. Mr. McGee is an enterprising and up-to-date plant manager. He has been president of the Iowa Electrical Association and has also taken part in the proceedings of the National Electric Light Association.

Mr. Frank C. Mason, a well-known old-time telegrapher and for a long period municipal electrician of Brooklyn, N. Y., has a beautiful country place, Glen Alex Farm, at Washington Mills, near Utica, N. Y. Mr. Mason has many friendships among the municipal electricians and telegraphers and invites his old companions to make him a call.

Mr. R. C. Hallett, representing the General Compressed Air and Vacuum Machinery Company of St. Louis, read a paper on Wednesday, August 12th, before the first annual convention of the Building Managers at the Auditorium, Chicago. The paper treated of the history of vacuum cleaning to date and pointed out the wonderful strides made in the brief period of the industry.

The following-named gentlemen have been appointed the British delegates to the International Conference on Electrical Units and Standards, which is to assemble in London on October 12th: Lord Rayleigh, Prof. J. J. Thomson, Dr. R. T. Glazebrook, Sir John Gavey and Mr. A. P. Trotter. Mr. W. Duddell and Mr. M. J. Collins will be the secretaries to the British delegates and Mr. F. E. Smith and Mr. C. W. S. Crawley assistant secretaries.

Mr. Harry McColgin, auditor of the Indianapolis and Louisville Traction Company, has been transferred from Scottsburg, Ind., to Pittsburg, Pa. He will continue to hold the same position, but hereafter the auditing of the traction company will be done at Pittsburg instead of Scottsburg. Mr. McColgin served as freight agent for the Indianapolis and Southern Traction Company for several years, and is a competent accountant and traction official.

Mr. E. L. Cline, for two years general manager of the Independent plant at Toledo, has succeeded J. E. Brailey as general manager of the Indianapolis Telephone Company. Mr. Cline announces that he has completed plans for the practical reconstruction of the Indianapolis plant. The company expects to spend upward of $50,000 in improved equipment, exclusive of the completion of its new building, as soon as the franchise now pending before the City Council is granted.

Mr. G. Marconi is coming to Canada in company with one of the directors of the English board of the Marconi Wireless Company. The inventor is desirous of making further improvements to the wireless service on this side of the Atlantic, and, during his stay in Canada, will spend considerable time at Glace Bay, Nova Scotia, improving the service at that point. It is understood that some definite arrangement will be made regarding a reorganization of the management of the company in Canada before Mr. Marconi returns to England.

Mr. John I. Beggs of Milwaukee, who holds large interests in the electric-light and railway properties in his city and in St. Louis, will remove his place of residence to the latter city in the near future. Heretofore Mr. Beggs has divided his time about equally between the two places as business necessity required and will continue to visit Milwaukee frequently after his removal, so that the change will in fact consist only in the transfer of some personal effects to the new home of Mr. Beggs' daughter, Mrs. McCulloch, now building in Washington Terrace, St. Louis.

ELECTRIC LIGHTING

The Royalton (Minn.) Power and Light Company has been incorporated with a capital of $10,-000, and will erect a modern lighting plant.

Brainerd, Minn., has voted bonds to the amount of $120,000 for a power plant.

The Aurora (Neb.) Electric Company has been incorporated with a capital stock of $35,000.

It is reported that the Mexican Light and Power Company and the Mexican Tramways Company are to be amalgamated at an early date. The two companies interested in the proposed merger represent, at the present time, a combined investment of $39,400,000.

The Golden Metal Mining Company of Hill City, S. D., which recently took over the Hill City Electric Power and Mining Company, in a short time will begin the construction of an electric power plant, which will cost $50,000. The company appropriated water rights and has every detail for the project well in hand.

The Rochester (N. Y.) Railway and Light Company will use oil instead of coal under its boilers, and believes it will not only solve its smoke problem, but give quick and satisfactory results in generating current when power service from Niagara is interrupted. The company is asking bids on storage tanks of 500,000 and 750,000 gallons capacity.

The City Council of Madison, Wis., has just enacted an electrical wiring ordinance, modeled after the one submitted by the Underwriters' Bureau inspector some time ago. The provision requiring periodical inspection of old work was omitted, but the inspector may compel the rewiring of old systems where extensions or alterations are made.

The Empresa de Tración y Alumbrado Electricos of Santiago, Chile, is installing a 22,000-horsepower hydraulic electric power plant at La Florida, whence the current is to be transmitted to the city over an underground cable at a tension of 12,000 volts. This will be sufficient to light and supply power for the works of the city for many years to come. The installation is principally German.

The Wisconsin Railroad Commission has declared its view of the public-utility law to be in favor of improving present existing plants rather than to permit the building of other plants. The village of Cashton complained that the Cashton Light and Power Company was furnishing inadequate service and prayed for a certificate of public convenience and necessity to build a municipal plant. The commission held that, inasmuch as the law provides means for compelling the existing company to provide adequate service, that the proper remedy should be used.

The Detroit Edison Company will proceed with its original plans for enlarging its power plant, which call for doubling the capacity. Two million dollars will be spent in the work. The foundations of the plant were laid last fall. For some time the capacity of the company has been taxed to furnish all the light and power demanded, and the growth of the city has made enlargement a necessity. This, it is said, is only one of the coming developments. Extensive plans are under way for the utilization of the Huron River, between Ann Arbor and Ypsilanti, and it is thought a part of a $7,000,000 bond issue will be used for this purpose. The company has also reached out toward Mount Clemens.

ELECTRIC RAILWAYS

Business men at Marshalltown, Iowa, are promoting an electric line to Charles City.

The work of remodeling the street cars of Chicago into the pay-as-you-enter pattern is rapidly progressing. The Chicago City Railway Company now has 300 cars of this type in operation and is steadily pushing the work of changing the remainder of its 805 double-truck cars at its shops. President Roach of the Chicago Railways Company has announced that he will lend his aid in the movement, and has 650 of these cars ordered, the first of which will be ready in October.

There are no cities of any note in the Japanese empire that do not possess a system of electric street cars, omnibuses, or motor cars, and almost every important place or pleasure resort in the country is connected with the main cities by one of the means of locomotion mentioned, so that the capital invested in such undertakings has reached a large amount. There are eight street-railway lines in service with an aggregate capital of $18,-530,000 gold. Adding smaller companies and several enterprises not yet opened, the aggregate capital of all the lines—those in operation or about to be operated—reaches a grand total of over $50,000,-000, with a mileage of 545.

POWER TRANSMISSION

Placerville, Cal., is contemplating a municipal hydro-electric power plant at Chili Bar.

The Beaufort Hotel Company, incorporated for $125,000 by C. L. Abernethy and others, contemplates building an electric-light plant at Beaufort, N. C.

At Denver, Colo., the Lignite Power Company has been incorporated by I. Danks, D. J. Morissey and D. R. Patterson with a capital stock of $50,000.

The Toronto (Canada) Power Company, which was recently incorporated, will take over the Electrical Development Company of that city, which has been in financial trouble.

The charter of the Central Georgia Power Company has been amended to increase the capital stock from $100,000 to $4,000,000. The company is one of the new enterprises for the development of the waterpowers of the state.

Wahpeton, N. D., has prepared a franchise which will bring water-generated electricity from Fergus Falls into the city for light and manufacturing power. An interurban road from Wahpeton to Sisseton may also be constructed to use the hydraulic power.

Lightning in the Telluride (Colo.) district did several thousand dollars' worth of damage to power-plant machinery last week. The junction house of the Telluride Power Company, the transformer house of the Mayflower Mining and Reduction Company and thte power house of the Telluride Electric Company were all struck.

The construction of a large electric power station in Lapland will be commenced shortly, it is reported. Either the Norr or Soderland Falls will be used, and it is proposed to erect the power station close to the Braunland railway station and within about 10 miles of the sea. The power available is estimated at 88,000 horsepower.

The Green Bay and Mississippi Canal Company, whose electric power house is now nearly completed, will immediately commence developing a large waterpower by the construction of a new dam across the Fox River, practically conserving all of the waterpower at Kaukauna, Wis. The new dam will give 28 feet head and will measure nearly 3,500 feet in length. When completed, it will be the longest one in the state of Wisconsin and will develop 3,000 horsepower.

The development of the hydraulic power property of William B. Bourne in Nevada County, Cal., is said to be proposed by the Southern Pacific Railroad. The property is located on the Yuba River above San Juan, and midway between the lines of the Southern Pacific and Western Pacific where they cross the Sierra. Engineers claim that power cannot be economically developed there for use in San Francisco, as the cost of maintenance of the long transmission line more than equals the cost of generating electric power with oil fuel at the Coast where oil is cheap. Outside the Grass Valley and other Nevada County mines, there is no sale for power in the immediate neighborhood other than to railroads. Surveying parties report that at Hell Hole, on the Rubicon River, in El Dorado County, ample power could be developed by throwing a dam across the narrow canyon walls, but this location is more remote from the line of the Southern Pacific than the power plant on the Yuba. Future plans calling for an expenditure of $6,000,000 on the Yuba properties have been determined upon, but the present work is intended simply to increase the power delivered to the mines nearby.

TELEPHONE

The Mount Pulaski (Ill.) Independent Telephone Company has been dissolved.

The Puyallup Valley Home Telephone Company has been incorporated at Tacoma, Wash., with a capital stock of $80,000.

The American Union Telephone Company has absorbed the Consolidated Telephone Companies of Pennsylvania, composed of Independent lines, with offices at Allentown, Pa., and operating in eight of the eastern counties of the state. The consolidation gives the American Union company lines between Youngstown, Ohio, and the Delaware River.

PUBLICATIONS

Coal-handling machinery, conveyors, industrial railways and other lines of labor-saving machinery manufactured by the C. W. Hunt Company, are illustrated and described in pamphlet No. 081, issued by the company, whose offices are at 45 Broadway, New York city.

The A M S brake equipment is explained in instruction pamphlet No. T 5035, a substantially bound booklet issued by the Westinghouse Traction Brake Company, Pittsburg. The A M S brake has found much use in electric service, and motormen should endeavor to master its principles, so that the brake may be handled with maximum efficiency.

Hawthorne short arc lamps are recommended by the Western Electric Company, particularly for buildings with low ceilings. In a recent folder it is pointed out that Western Electric arc lamps light up quietly, with positive action, and the feeding mechanism keeps the carbons at just the right point to give a steady, uniform illumination.

SOCIETIES AND SCHOOLS

President Alex Dow announces that the annual convention of the Association of Edison Illuminating Companies will be held at the Hotel Aspinwall, Lenox, Mass., on September 15th, 16th and 17th. Preliminary committee meetings will be held on the day preceding the opening of the convention.

The demand for young men with a more extended and a deeper training in electrical engineering theory than can be obtained in an undergraduate engineering course has led the Massachusetts Institute of Technology to emphasize its graduate courses. These graduate courses lead either to the degree of master of science for young men who propose to spend one year of advanced study of electrical engineering or to the degree of doctor of philosophy or doctor of engineering for young men who are able and propose to spend longer periods in their advanced study and research. The advanced courses are planned particularly with a view to meeting the needs of such students as have hitherto found it necessary to go to foreign countries for advanced engineering instruction.

The Arkansas Association of Public Utilities Operators, which was formed last July, will hold its first annual convention at Little Rock on September 17th and 18th. Membership in the association is divided into the following classes: Class A, public-service corporation operators and executive officers; Class B, salesmen of companies dealing in supplies for public-utility corporations; Class C, honorary members. Only members of the first class have a voice in the direction of the association's affairs. As set forth, the purpose of the organization is advancement of public utilities in Arkansas. D. A. Hegarty, general manager of the Little Rock Railway and Electric Company, is president of the association, and J. E. Cowles, superintendent of lighting for the Hot Springs Light and Railway Company, is secretary.

The Ohio Electric Light Association, which will hold its annual convention at Put-in-Bay, Ohio, on August 25th, 26th and 27th, has prepared and sent to members and guests an attractive combined invitation programme and souvenir. The book, or at any rate some copies of it, is bound in green flexible leather and bears the silver seal of the association. Among the contents are a brief description of the organization, the lists of members, officers and committees, and the programmes for the daily sessions. The pages are illustrated with portraits of the officers and scenes in and about Put-in-Bay. The pages are printed in two colors on heavy calendered paper and the whole souvenir presents a tasteful appearance. D. L. Gaskill of Greenville is secretary of the association.

MISCELLANEOUS

The City Council of Memphis, Tenn., is considering a new electrical inspection ordinance which provides for the examination of the electrical inspector by a commission and the bonding of local electrical contractors.

Large deposits of tungsten are present in the quartz seams of Noble Island, situated about 80 miles north of Cooktown, Queensland, Australia. The veins have been worked on the surface only for about four years with good results. There is, however, no permanent water supply and no serviceable timber for mining purposes on the island.

Tubes of glass found in sand are explained by lightning strokes which have struck the earth near by and, passing into the ground, have melted the silicious material forming little pipes. Such tubes measuring as much as 27 feet in length have been discovered. No doubt exists as to the method of their production, inasmuch as they have been dug up still hot from places freshly struck by lightning. Attempts have been made to reproduce them artificially by passing a powerful disharge through finely powdered glass, and in this way pipes nearly an inch long as big as a darning needle have been obtained.

TRADE NEWS

The time for opening proposals for the construction of the extension (including plumbing, heating apparatus, electric conduits and wiring) of the United States postoffice at Little Rock, Ark., is extended until 3 p. m. on September 21st.

Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until 3 p. m. on September 22d for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States postoffice at Greenwood, S. C. Drawings and specifications may be obtained from the custodian of site at Greenwood, S. C., or at the office of the supervising architect in Washington.

Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until September 18th, for the installation of a vacuum-cleaning system for the United States postoffice and court house building at Rochester, N. Y. Drawings and specifications may be obtained at the office of the supervising architect or at the office of the superintendent, Rochester, N. Y.

An American consul in Mexico reports that the telephone service in the city in which he is located is very unsatisfactory, so much so that many business men have discontinued its use and substituted messengers. The consul adds that there is a good field there for an efficient service, and a company that will secure a concession and guarantee to give satisfactory service with a modern and up-to-date system, is sure to be successful. Address inquiries to the Bureau of Manufactures, File No. 2435, Washington, D. C.

Sealed proposals for the construction of an electric-light plant will be received by the city of Chilton, Wis., at the office of the city clerk, Mr. Jos. Grassold, until Tuesday, September 1st. The required construction will consist of a 50-kilowatt alternating-current generator, pole lines and wiring for arc-lighting system and steam or gas-producer power plant. Plans and specifications may be seen at the above address. Proposals must be made out on blank forms, to be furnished by the city, and must be accompanied by a certified check for $1,000 for the entire work, or $500 for each portion of the work. The city reserves the right to reject any or all bids.

Dossert & Co. of 242 W. Forty-first Street, New York, have received orders from Westinghouse, Church, Kerr & Co. for 115 special solderless elbow connectors in 300 and 600-ampere sizes, to connect the station buses through oil switches to the 2,400-volt outgoing lines at the Dutch Point Station of the Hartford Light and Power Company, Hartford, Conn. These elbow connectors can be used to make joints at either right or left angles, and afford an illustration of the flexibility of the Dossert devices. Other large orders for solderless connectors have been received from the Philadelphia Electric Company, Philadelphia, the Birmingham Coal and Iron Company, Mulga, Ala., and the San Francisco Gas and Electric Company, San Francisco, Cal.

The Compania Azucarera del Panuco has just purchased for its sugar plantation, at "El Higo," some 200 kilometers up the Panuco River, above Tampico, Mexico, a gas plant to pump water for irrigating purposes. This outfit, purchased through Messrs. G. & O. Braniff & Co., representatives of the Westinghouse Electric and Manufacturing Company of Pittsburg and the Westinghouse Machine Company, consists of a suction gas producer, to operate on charcoal or anthracite coal, having a capacity of 150 horsepower, and a Westinghouse three-cylinder gas engine of 140-horsepower capacity. This engine will drive, by means of a belt, a centrifugal pump, having a capacity of 285 liters per second (about 4,500 gallons per minute), against an approximate head of 25 meters. The water will be delivered to the cane fields, some 625 meters distant, by means of steel pipe. This is another example of the advantages of gas engines for cheap irrigation.

The Roller-Smith Company, recently incorporated in New York state with a capital of $100,000, has acquired by purchase the properties of the Whitney Electrical Instrument Company of Penacook, N. H., and of the Switchboard Equipment Company of Bethlehem, Pa. The new company will continue to manufacture and develop further the lines heretofore manufactured by the acquired companies, and is now erecting in Bethlehem, Pa., a modern factory which will be completed about November 1st. The present plants of the Whitney Electrical Instrument Company and of the Switchboard Equipment Company will then be abandoned. The new factory will cover about 15,000 square feet on a plot of ground of about two and one-half acres, thus allowing for ample extension. The Roller-Smith Company will manufacture ammeters, voltmeters, ohmmeters, galvanometers, bond testers and circuit-breakers and other similar apparatus. The principal office of the company will be in Bethlehem, with its chief sales office at 203 Broadway, New York city, in charge of Machado & Roller, general sales agents. Mr. Roller, the president of the Roller-Smith Company, has been actively connected with the Whitney Electrical Instrument Company and with Machado & Roller for some time. The treasurer, D. R. Smith, has been president of the Switchboard Equipment Company since its organization about three years ago. The other officers of the new company are: Vice-president, F. W. Iredell; secretary, H. A. Whitman; directors, F. M. Roller, F. W. Iredell, P. Van Wyck, R. S. Taylor and D. R. Smith.

BUSINESS

The Central Electric Company, Chicago, has recently completed delivery of a large number of New Lexington high-tension porcelain insulators, for use on the lines of the Sanitary District of Chicago.

The Rathbone-Panigot Company, Grand Rapids, Mich., maker of the electric open fireplace, is offering a special proposition to central stations, good only until September 15th. The company will be glad to hear from central stations wishing to increase their sale of current.

A new machine shop and foundry is under construction for the Goldschmidt Thermit Company of 90 West Street, New York city. The building occupies a site 34 by 99 feet, and is fitted up for the purpose of handling to better advantage the extensive repair work which is now being carried on at these works. Traveling cranes will be provided, and no expense will be spared to make the building the most complete Thermit repair shop in the country. Special attention will be paid to the rapid execution of the repairs to electric-motor cases, truck frames, cast-steel gear wheels, crank shafts, and, in fact, any wrought-iron and steel sections not exceeding 2,000 pounds in weight.

The American Engineering Specialty Company, an Illinois corporation, has opened offices at 720 Newton Claypool Building, Indianapolis. The company makes a specialty of the manufacture of equipment and the erection of steam, water, gas and other plants. Mr. Theodore Weinshank is state agent.

The Joseph Dixon Crucible Company, Jersey City, N. J., announces that it has registered the word "Flake," as applied to graphite. This term was originated by the Dixon company to distinguish that form of graphite, as it comes from the mines at Ticonderoga, from the thick form such as is mined in Ceylon.

DATES AHEAD

Ohio Electric Light Association (annual convention), Hotel Victory, Put-in-Bay Island, August 25th, 26th and 27th.

Association of Edison Illuminating Companies (annual convention), Hotel Aspinwall, Lenox, Mass., September 15th, 16th and 17th.

Old Time Telegraphers' Association and Society of the United States Military Telegraph Corps (annual reunion), Cataract-International Hotel, September 16th to 18th.

Colorado Electric Light, Power and Railway Association (annual convention), Glenwood Springs, Colo., September 16th, 17th and 18th.

Arkansas Association of Public Utilities Operators (first annual convention), Little Rock, Ark., September 17th and 18th.

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

American Electrochemical Society (fall meeting), New York city, October 30th and 31st.

Chicago Electrical Show (fourth annual), Coliseum, January 11th to 23d, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) August 11, 1908

895,421. Mail-pouch Receiving Apparatus for Railway Cars. Chauncey W. Broughton, Carlton, Ill. Application filed March 25, 1908.

The mail pouch is supported electromagnetically and is released by opening the circuit through automatic means provided by the invention.

895,426. Pressure-reducing Valve. Frank T. Cable, Quincy, Mass., assignor to the Electric Boat Company, New York, N. Y. Application filed November 30, 1907.

The valve is controlled by a solenoid which admits pressure to a diaphragm furnishing the movement for the valve plug. The electrical circuit is energized through a contact device containing a column of liquid sustained by the pressure.

895,431. Enclosed Fuse. Robert C. Cole, Hartford, Conn., assignor to the Johns-Pratt Company, Hartford, Conn. Application filed January 31, 1907.

The fuse enclosure is vented by open vent-holes covered with a reticulate screen of fuzzy material which retains the comminuted interior.

895,432. Enclosed-fuse Terminal. Robert C. Cole, Hartford, Conn., assignor to the Johns-Pratt Company, Hartford, Conn. Application filed February 16, 1907.

The terminal comprises an apertured ferrule, and a contact blade with a tubular boss upset against the ferrule.

895,434. Vehicle-speed Signal. George L. Cooper, Troy, N. Y., assignor of 35 one-hundredths to Joseph F. Bush, Schenectady, N. Y. Application filed February 20, 1908.

The speedometer arrangement indicates the movement and the power taken by the car.

895,441. Electric Outlet Box. Conrad J. Dorff, Chicago, Ill., assignor to Frederic Greer, Chicago, Ill. Application filed June 22, 1907.

The outlet box has flanged openings closed by peripherally flanged slugs.

895,443. Coin Box for Telephones. Charles S. Ellis, Chicago, Ill., assignor to the American Coin Register Company. Application filed September 6, 1904.

Electrical means deflect the coin-pocket into alignment with the slot channel.

895,460. Thermostatic Circuit Controller. Herman L. Hicks, Martins Ferry, Ohio. Application filed February 15, 1908.

The thermostat which is applied in a gas burner closes an alarm-bell circuit.

895,485. Vacuum-tube Lighting. Daniel M. Moore, Newark, N. J., assignor to the Moore Electrical Company, New York, N. Y. Application filed April 2, 1906.

The vacuum tubes have their conducting terminals housed in a common protective casing.

895,486. Vacuum-tube Apparatus. Daniel M. Moore, Newark, N. J., assignor to the Moore Electrical Company, New York, N. Y. Application filed April 2, 1906.

An automatic valve admits gas to the vacuum tube from a reservoir under pressure, in response to changes of gas tension in the tube.

895,487. Vacuum-tube Apparatus. Daniel M. Moore, Newark, N. J., assignor to the Moore Electrical Company, New York, N. Y. Application filed April 2, 1906.

Combined with the vacuum tube is a receiver containing a liquid material capable of evolving a gas which is admitted to the tube, as required, by an automagnetic valve.

895,490. System for the Generation and Distribution of Electricity. Thomas H. McAdory, Chicago, Ill., assignor to the Adams & Westlake Company. Application filed April 17, 1908.

One of the mains connecting the generator with a storage battery is divided into two branches, one of which contains a variable resistance interposed by superimposed discs on which a weighted arm presses. A core, controlled by a voltage coil from the battery, carries the arm. (See cut on next page.)

895,515. Dynamo-electric Machine. Egbert M. Tingley, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, Pittsburg, Pa. Application filed April 4, 1906.

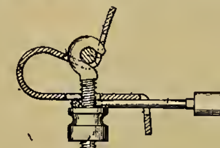
A stationary ring-wound armature core is supported by interposed supports of non-magnetic material between which the coil-supporting devices are inserted.

895,524. Automatic Weighing Machine. Thomas R. Weyant, New York, N. Y. Application filed September 27, 1906.

An electromagnet, controlled through a depressing contact, governs the flow of the material to be weighed into the pans.

895,545. Connecting Device for Electrical Conductors. Ernest B. Fahnestock, New York, N. Y. Application filed November 24, 1905.

The rigid loop-member of the familiar Fahnestock binding-post is supplanted by a stiff hook. The pressure of the spring member is adjustable by a nut moving on the threaded shaft of the hook. (See cut.)



No. 895,545.—BINDING-POST

895,549. Storage Battery. George A. Ford, Cleveland, Ohio, assignor to Harriet S. Ford, Cleveland, Ohio. Application filed October 27, 1905.

Trays, molded of paper pulp and shaped with reinforced upturned margins and sloping bottoms, carry the electrode plates. The pairs of plates have intermeshing vanes.

895,575. Electric Car-recording Block Signal. William J. Murray, Leavenworth, Kan., assignor of one-half to Herbert W. Wolcott, Leavenworth, Kan. Application filed April 16, 1907.

A step-by-step energization serves to close one contact and to open a second simultaneously.

895,582. Rail Bond for Electric Railways. William E. Oakley, Millbury, Mass., assignor to the Worcester Steel Foundry Company, Worcester, Mass. Application filed December 2, 1904.

The terminals are cast and composed of two metals, thoroughly mixed before pouring, one of the metals having a normal temperature coefficient approximating that of the rail, and the other having a low electrical resistance.

895,589. Electric Signal for Railways. John S. Sims, Longbeach, Cal., assignor of one-half to Edward Richard Millar, Longbeach, Cal. Application filed September 25, 1907.

The signal targets, operated by electromagnets, are normally concealed when the magnets are energized. A second set of control magnets governs the operation of the motormagnets in accordance with the impulses transmitted from the train on the insulated sections of track.

895,591. Thin-place Detector for Looms. William J. Stewart, Webster, Mass. Application filed January 22, 1906.

A feeler presses on the cloth and controls an electrical contact which operates a throw-out motion by means of a solenoid.

895,594. Arc Lamp. Bernard A. Stowe, Cleveland, Ohio, assignor to the Jandus Electric Company, Cleveland, Ohio. Application filed August 3, 1905.

A ventilation channel taps the portion of the globe inclosure containing the heaviest gases.

895,638. Water-heating System. Harry M. Hill, St. Louis, Mo., assignor to the Hill Electrical Manufacturing Company, St. Louis, Mo. Application filed May 13, 1907.

The resistance element interposed in the pipe line is controlled by a pressure-operated switch which opens the heating circuit when the flow of water has ceased.

895,660. Electric Battery. William Morrison, Chicago, Ill., assignor to George Rumrill Coryell, Chicago, Ill. Application filed August 11, 1902.

This bromine storage battery consists of a cell of carbon which is also the negative element. The battery is so constructed that the deposit of bromine is held by gravity upon the upper surface of the bottom of the cell.

895,714. Binding Post. Garrison Babcock and Josef Reuter, Rochester, N. Y., assignors to Merton E. Lewis, Rochester, N. Y. Application filed June 25, 1906.

The base member has an incline clamping face at one end and a pivot slot at the top. A clamping plate is forced down on the wire by a threaded nut.

895,715. Thermochemical Generation of Electricity. Lucien P. Basset, Paris, France, assignor to Maurice Bacqua de Labarthe, Paris, France. Application filed March 27, 1906.

Two electrolytes are circulated in compartments separated by porous walls, one of the electrolytes being a weak solution of sulphuric acid containing sulphurous acid, and the other being a weak solution of sulphuric acid containing bromine. The electrolytes react on each other to form hydrobromic acid and sulphuric acid. The electrolyte may be regenerated by heat into bromine and sulphurous acid.

895,729. Art of Separating Suspended Particles from Gaseous Bodies. Frederick G. Cottrell, Berkeley, Cal., assignor to the International Precipitation Company, San Francisco, Cal. Application filed July 9, 1907.

The separation of suspended particles from gaseous bodies consists in subjecting the gases to the action of a system of electrodes maintained at a high difference of electrical potential by intermittent connection with a source of alternating current, at intervals synchronized with the current period.

895,732. Construction of Batteries and Electrolytic Apparatus. Frank A. Decker, Philadelphia, Pa., assignor to the Decker Electrical Manufacturing Company, Wilmington, Del. Application filed February 11, 1905.

The cups comprising flanged diaphragms are bonded together by rubber seals vulcanized in place.

895,747. Binding Post. Monroe Guett, Hartford, Conn. assignor to the Hart & Hegeman Manufacturing Company, Hartford, Conn. Application filed October 5, 1906.

The cylindrical binding post has two openings into the central bore. Non-rotatable binding studs movable lengthwise through the openings are connected by a bridge.

895,752. Lightning Arrester. Ernst Heddaeus and Rudolf Nothnagel, Bilbao, Spain. Application filed November 30, 1907.

The arrester comprises a pair of oppositely rotating discharge bodies mounted on parallel axes, one of the bodies having a peripheral cam whereby the space separating the bodies will be gradually varied in width as the bodies rotate.

895,760. System of Electrical Distribution. Robert C. Hull, Philadelphia, Pa. Application filed January 3, 1908.

Controlling apparatus is adjusted to be responsive to variations from a predetermined battery condition and adapted to restore that condition. The time required by the apparatus to produce a given effect is controllable.

895,772. Secondary Electric Clock. Frank F. Landis, Waynesboro, Pa. Application filed September 11, 1906.

The lever, carrying the driving pawl engaging with the ratchet wheel, is so weighted as to drive the clock reversely to the power of the magnets.

895,777. Coin-operated Attachment for Pay Telephones. Edmond J. Lonergan, Chicago, Ill. Application filed February 19, 1908.

The patented feature is a mechanical arrangement of the coin slot and controlling lever.

895,785. Means for Supplying and Controlling Electric Current to Motor Vehicles. Alexander Palmros, Columbus, Ohio, assignor to the Jeffrey Manufacturing Company, Columbus, Ohio. Application filed September 12, 1900. Renewed November 19, 1906.

Power to drive the mining locomotive may be taken at will from an overhead trolley or from storage cells carried on the car.

895,801. Current Transformer. Paul Schubert, Berlin, Germany, assignor to the General Electric Company. Application filed August 27, 1906.

The primary winding consists of two portions producing opposing alternating fluxes in the core. Additional means varies the flux passing through the secondary winding.

895,806. Trolley. Frank L. Sessions, Columbus, Ohio, assignor to the Jeffrey Manufacturing Company, Columbus, Ohio. Application filed May 24, 1904.

A reversible contact-bow bar is held in position by a spring when past its dead center in either direction.

895,822. Rheostat. Charles Wirt, Philadelphia, Pa., assignor to Charles Wirt & Co., Newark, N. J. Application filed July 12, 1905.

A molded body of insulation forms the body of the rheostat and in this the resistance conductor, contact blocks and hub for the moving element are embedded and mechanically held by the setting of the insulating body around them.

895,823. System of Electrical Distribution. Joseph L. Woodbridge, Philadelphia, Pa. Application filed October 2, 1907.

The stator windings of an induction machine are connected to the polyphase circuit and the rotor windings are connected at appropriate points to the single-phase circuit which supplies a synchronous machine. The rotor winding may be short-circuited as provided, and a fixed mechanical relation is held between the shafts of the two machines.

895,824. Electric Generator. Joseph L. Woodbridge, Philadelphia, Pa. Application filed December 7, 1907.

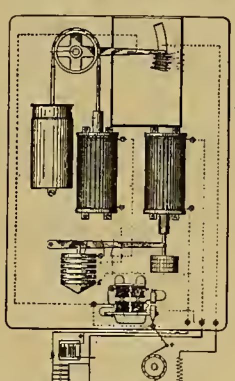
The generator pole frame has polar projections in groups of three and field windings adapted to produce in each group magnetic flux of like polarity in two of the poles and in the third a flux equal to the sum of that in the other two and of opposite polarity. The armature is provided with brushes so disposed that the armature coils between any pair of brushes are acted upon by the flux in only two poles in each group of three.

895,825. System of Electrical Distribution. Joseph L. Woodbridge, Philadelpjhia, Pa. Application filed January 3, 1908.

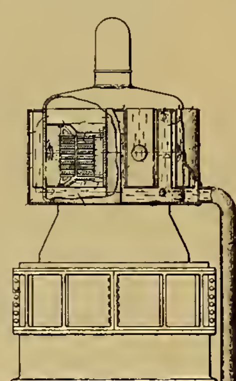
The apparatus controls the division of load between the generator and the battery, preventing further transfer of load to the generator after its load reaches a certain value.

895,830. Electric Brake. Edward H. Anderson, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed July 23, 1901.

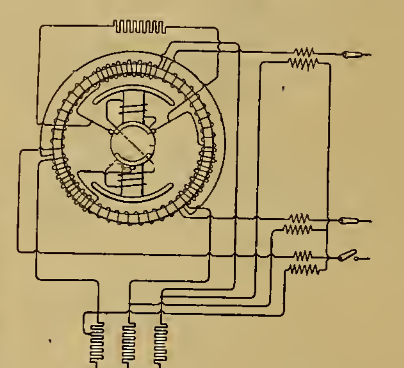
An electric motor is arranged to wind up the chain of the brake-rigging, the motor being caused to rotate by the turning of the brake-handle, and to keep slightly in advance.



No. 895,490.—DISTRIBUTION SYSTEM



No. 895,894.—GENERATOR COOLING



No. 895,933.—SELF-EXCITING GENERATOR

895,831. Constant-current Transformer. Lyman Arnold, Lynn, Mass., assignor to the General Electric Company, Schenectady, N. Y. Application filed March 9, 1907.

The transformer comprises a number of sets of relatively movable primary and secondary coils and a common magnetic core. A number of independent constant-current circuits are supplied from the secondary coils of the transformer.

895,836. Controlling Device for Electric Motors. Ralph E. Barker, Lynn, Mass., assignor to the General Electric Company, Schenectady, N. Y. Application filed December 26, 1907.

A traveling-ball mechanism changes the supply connections to the motor when the contact is moved from the horizontal position.

895,839. Insulated Rail Joint. Bancroft G. Braine, Brooklyn, N. Y., assignor to the Rail Joint Company, New York, N. Y. Application filed May 24, 1907.

The side joint bars have each a short length base section affording a support for one rail end. A double wall extends along that portion of the bar having no rail-supporting section.

895,854. Voltage Protector. George T. Hanchett, Hackensack, and Henry M. Shaw, East Orange, N. J. Application filed October 3, 1906.

Oil is pumped through a grounded nozzle electrode and impinged against the recessed face of an electrode connected to the line.

895,864. Trolley. Albert S. Janin, New York, N. Y., assignor of one-third to Amelia Janin, Brooklyn, N. Y. Application filed December 12, 1906.

A collapsible diamond-shaped frame consists of upper and lower pivotally connected members, the frame having its surfaces rounded at the junction of its parts, and the upper ends of its upper members upwardly curved and inwardly inclined, so that the frame is rendered a guide and director for the wire through its exterior marginal surface.

895,869. Rectifier System. Ossias O. Kruh, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed December 28, 1906.

The insertion of reactance displaces the phase of one of a number of transformers supplying a mercury-arc rectifier.

895,878. Brush Holder. Floyd C. Mitchell, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed April 20, 1906.

The holder consists of a stud in which is formed a slot serving to hold a plate. The brush-carrying member has a socket which loosely receives the stud.

895,887. Acyclic Machine. Jakob E. Noeggerath, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed January 16, 1906.

The stationary homopolar field structure has poles extending uniformly around the armature. Collector rings are carried by a non-magnetic shell surrounding the armature.

895,888. Unipolar Dynamo-electric Machine. Jakob E. Noeggerath, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed April 1, 1907.

The field structure is unipolar and the armature carries a number of collector rings which are interconnected by conductors.

895,894. Means for Cooling Dynamo-electric Machines. Richard H. Rice, Lynn, Mass., assignor to the General Electric Company, Schenectady, N. Y. Application filed November 2, 1907.

An inner casing has inlet and outlet pipes communicating with a supply of cooling liquid. (See cut.)

895,911. Wall Bracket for Electrical Conductors. Lucius Tinsley, Crawfordsville, Ind. Application filed December 7, 1907.

Inner and outer insulating members are each provided with end grooves, and a clamping yoke surrounds the inner member and embraces the top of the outer member, the yoke being thickened to fit in the grooves.

895,914. Variable-voltage Transformer. Matthew O. Troy, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed December 22, 1905.

Stationary coils are spaced on a core, and two movable magnetic members are magnetically balanced, arranged to vary the reluctance respectively of a magnetic circuit passing through one of the coils and of a magnetic circuit shunting the coil.

895,916. Lightning-rod Terminal. John P. Turner, New York, N. Y. Application filed August 20, 1907.

A perforated hollow body of sheet metal filled with carbon is pressed into contact with a tube through which the lightning rod passes.

895,925. Electric Organ. William R. Whitehorne, Bethlehem, Pa. Application filed September 7, 1906.

Air is admitted to the pipes by electrically operated valves.

895,928. Rail Bond. Montraville M. Wood, Chicago, Ill., assignor to the General Electric Company, Schenectady, N. Y. Application filed September 9, 1901.

The bond-terminal plug has a tapered hole into which a pin may be driven, so as to compress the material of the terminal into close contact with the rail.

895,933. Self-exciting Generator. Ernst F. W. Alexanderson and Emil H. Widegren, Schenectady, N. Y., assignors to the General Electric Company, Schenectady, N. Y. Application filed November 21, 1907.

The alternating-current generator has a rectifying commutator which supplies the field. There are additional means for supplying polyphase shunt voltages to the brushes to excite the field, for compounding the voltages for variation of load on the generator, and for adjusting the exciting circuits to compensate for unequal compounding of the different phases of the exciting voltages (See cut.)

895,956. Lightning-arrester Resistance. Harold W. Buck, New York, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed January 25, 1907.

The flexible resistance unit for the lightning arrester consists of a woven envelope of fibrous asbestos with a filling of granular resistance material.

895,958. Electromagnetic Sparking Plug. Otto Carlborg, Providence, R. I. Application filed June 9, 1906.

For combustion engines, the sparking electrodes of the plug within the explosive chamber are operated by a pair of magnets through a bar from the exterior.

895,965. Regulation of Dynamo-electric Machines. Reginald C. Clinker, Rugby, England, assignor to the General Electric Company, Schenectady, N. Y. Application filed September 28, 1905.

For a series machine the invention provides means for momentarily augmenting changes of voltage at the terminals of the winding due to changes in the load on the armature circuit proportionately to the rate of change of the load.

895,977. Combined Fuse Box and Cut-out Switch. Christopher C. Dawber, Clifton, Ariz. Application filed June 26, 1907.

The box is designed for link fuses, and the cut-out switch contact is closed by threaded studs.

895,978. Apparatus for Transmitting and Reproducing Sounds. Joseph A. L. Dearlove, London, England. Application filed January 30, 1905.

In the transmitter described the hydrostatic pressure of the water is balanced by air pressure on the diaphragm.

895,983. Railway Signal. Hoyt A. Dillon, Council Bluffs, Iowa, assignor of four-fifths to A. T. Austin, Omaha, Neb. Application filed August 19, 1907.

The electromagnets controlling the visual signals are in two balanced circuits. When the rails are connected both sets of magnets are short-circuited.

895,993. Trolley Support. Hiram G. Farr, Melrose Highlands, Mass. Application filed October 22, 1907.

Lubrication is effected by a wick enclosed in an oil chamber recessed in the trolley-wheel bearing-axle. The chambers in both wheel and axle are filled with absorbent material.

896,005. Attaching Plug. Henry Geisenhöner, Schenectady, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Application filed August 22, 1903.

The plug consists of an insulating base having a reduced section adapted to the thrust endwise into a socket and arranged to force the side contact radially outward, insuring a good contact.

896,060. Filament for Electric Incandescent Lamps and Process of Making the Same. Hans Kuzel, Baden, near Vienna, Austria-Hungary. Application filed May 7, 1907.

The process applies to manufacturing particularly thin tungsten filaments for incandescent lamps and consists in producing a plastic mass containing tungsten and colloidal oxynitride of tungsten, of which threads are formed and dried and finally heated to a white heat in a non-oxidizing atmosphere.

896,070. Apparatus for Drying Out Molding Flasks. Charles I. Williams, Utica, N. Y. Application filed February 11, 1905.

The sand-molding flask has electric heating coils adapted to enter its interior and passing through steam vents in the cover.

896,071. Electric Railway. John A. Garey, Mound City, Mo., assignor of one-half to George G. Garey, Indianapolis, Ind. Application filed August 12, 1907.

The collecting wheel, which runs on a third rail, is protected by plows and the whole collecting structure is maintained in position by air in cylinders supplied from a tank carried on the car.

Reissue

12,841. Electric Switch. Everett M. Coffin, Oakland, Cal. Application filed June 24, 1908. Original No. 881,300, dated March 10, 1908.

The mechanism of a double-push switch for a house-lighting circuit is described.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired August 18, 1908:

457,778. Closed Conduit System for Electrical Propulsion. Wm. B. Heron, Brooklyn, N. Y.
457,816. Automatic Telegraph. D. Kunhardt, Aachen, Germany.
457,828. Method of Insulating Electric Conductors. T. R. Morford, Minneapolis, Minn.
457,836. Electric-railway Appliance. F. E. Degenhardt, Chicago, Ill.
457,838. Electric Stop Mechanism. W. H. Kilbourne, Greenfield, Mass.
457,870. Electric-railway System. M. Shoemaker, Sioux City, Mo.
457,875. Electromotor Engine. S. Ziani de Ferranti, Hampstead, England.
457,879. Machine for Casting Grids for Secondary Batteries. A. F. Madden, Newark, N. J.
457,902. Electric Motor. C. J. Kintner, New York, N. Y.
457,906. Electric Door Opener. R. J. Ward, Brooklyn, N. Y.
457,944. Electric-railway System. S. E. Wheatlet and J. W. Schlosser, Washington, D. C.
458,025. Electric Arc Lamp. E. Thomson, Swampscott, Mass.
458,063. Electric Wire Crossing. C. H. McKee, St. Louis, Mo.
458,115. Method of Electric Welding and Straightening. E. Thomson, Lynn, Mass.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, AUGUST 29, 1908 No. 9

ELECTRICITY AT THE FRANCO-BRITISH EXHIBITION

[From the London correspondent of the Western Electrician.]

The lighting and decorative effects at the Franco-British Exhibition are a veritable triumph of electricity, although curiously enough, little appeared to be known of the magnitude of the electrical work there until the exhibition was on the verge of opening. Color was lent to the idea that electricity would be more or less in the background by an early announcement from the gas companies that by a combination of gas interests there was to be a comprehensive gas exhibit. The electric supply companies of London at once commenced to organize a rival electrical show. The Institution of Electrical Engineers took the matter in hand officially, but its efforts at securing any considerable amount of co-operation on the part of electric supply and manufacturing firms proved unavailing, the main reason assigned being the electrical exhibition at Manchester in the Autumn. Consequently it was announced that the project had been abandoned.

However, the London electric-lighting companies were very keen, and on their own initiative they took a space in the Machinery Hall whereon a model flat has been erected showing every possible use of electricity. An appeal was made to the electrical industry to subscribe to the cost of current, attendance and so on, it being computed that if about 30 firms would come in, the cost per firm would only be about £20. This appeal, fortunately, was successful. In the meantime, almost unsuspected, the exhibition authorities had been planning the use of electricity on a scale never before approached in an exhibition, so that, even without a special demonstration of the domestic uses of electric power, gas would have been quite dwarfed. Those who are acquainted with the keenness of the competition between gas and electricity all over the United Kingdom, and more especially in London, will realize the feelings of the electrical industry in this matter.

The arrangements for the supply of electricity to the exhibition include an agreement with the Borough Council of Hammersmith—in whose area the exhibition grounds are—for a supply in respect of which there is a guarantee of £10,000; there is a Parsons turbo-alternator set in the Machinery Hall and a Westinghouse gas-engine set, both of which supply current for lighting and power purposes there. The agreement with the Hammersmith Council involved such a large capital expenditure that arrangements had to be made with the Notting Hill Electric Lighting Company, whose power house is quite close to the exhibition, for a portion of the supply.

To deal first with the supply from the Hammersmith Council in conjunction with the Notting Hill company, the former supplies 2,200-volt, single-phase current at 50 cycles, and the latter 5,000-volt, three-phase current at a similar frequency. They feed into four sub-stations in the exhibition grounds, the cables being in triplicate, those from the Borough Council being 0.25 square inch concentric lead-covered, and those from the company 0.125 square inch in three core. The main sub-station is situated near the Wood Lane entrance to the exhibition, and there are two other sub-stations in the Machinery Hall which receive their supply from the Wood Lane sub-stations. In each there is a bank of transformers having a capacity of 600 kilowatts, the secondary sides of the single-phase transformers being wound to give current on the three-wire system at 440 volts between the outers, the three-phase transformers being star-connected with the neutral grounded, and wound to give 220 volts between any phase and neutral. The supply contracted for from the outside sources is about 3,000 kilowatts, the exhibition authorities, who are responsible only to the Borough Council, paying 1d. per unit from sunrise to sunset, and 2d. per unit from sunset to sunrise, with a guaranteed minimum payment of £10,000, as already indicated. On the other hand, the Council, for the supply which it will obtain from the company, is paying 0.8d. per unit for a guaranteed minimum consumption of 1,000,000 units and 0.75d. per unit for all consumption beyond this. In connection with this portion of the installation alone, it is interesting to note that the supply is far larger than in many town installations, while the nature of the work carried out is so permanent as to lend color to the suggestion that it is not intended to shut the exhibition in October. It may here be pointed out that the area of the site covered by the exhibition is about 240 acres.

Of the auxiliary supplies, the most interesting is the gas plant supplied by the British Westinghouse Company and the Gas Power Corporation. The gas engine, which is vertical, is of 750-kilowatt capacity and is direct-connected to a continuous-current Westinghouse generator, the set running in conjunction with the Parsons turbo-alternator set. As will be seen from the photograph, the cylinders of the gas engine, in pairs, are placed over the three cranks, by which arrangement the makers claim that they can give the most even turning moment of any gas engine on the market. No water cooling is used for the piston, valves or other moving parts, thus avoiding any danger of breakage of pistons, which is often a source of trouble in connection with large horizontal engines. Forced lubrication is used throughout, the oil pumps being in duplicate, and these can be examined and the oil sieves changed while the engine is in operation. All valves are positively operated by means of straight push rods actuated directly from the cam shaft. These are all arranged with adjustable screws, so that any play or wear can be taken up on these valves while the engine is running.

The gas plant working with this engine has a capacity of 2,000 horsepower, and consists of two Mond producers seven feet internal diameter, one patent mechanical washer, one gas-cooling tower, two centrifugal cleaners, two scrubbers and a governor. The fuel on entering the producer from the charging hopper goes into a cylindrical bell which has for its object the maintaining of a constant level of fuel. The gas producer consists of two cylindrical steel shells, one within the other, the annular space between them forming an air jacket in which the air and steam blast is super-

Court of Honor by Day — Machinery Hall
Court of Honor by Night — Another Night View in Court of Honor

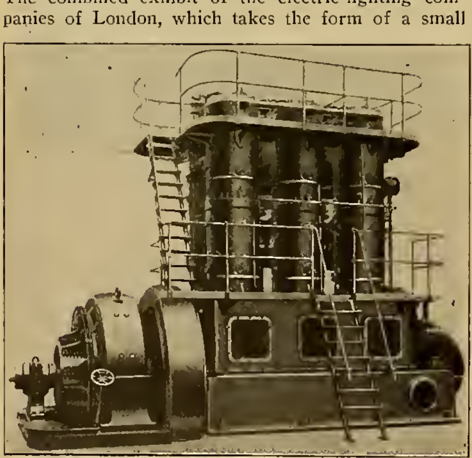
THE FRANCO-BRITISH EXHIBITION IN LONDON

heated on its way to the space beneath the grate, which consists of specially designed fire bars set radially in the form of an inverted cone. The gas leaving the producer passes into a rectangular steel washer, in which it is brought into intimate contact with water sprayed by quickly revolving dashers or paddles. On leaving the washer the gas enters at the bottom of a gas-cooling tower packed with short earthenware tubes, which distributes over the whole area of the tower the water which is supplied at the top. The gas then passes into a pair of specially designed centrifugal cleaners, into which a small amount of water is introduced. Here the gas is still further cooled down and freed from tar, and when it leaves this apparatus it only contains a small trace of tarry matter, which is removed as the gas passes through the scrubbers, which are rectangular steel boxes fitted with a number of trays on which are placed simple wood planings or shavings and sawdust. The gas then passes to the gas engine.

The turbo-alternator set, which also supplies a portion of the energy used in the Machinery Hall, is a Parsons 2,000-horsepower equipment, supplied with steam at 160 pounds pressure from three Babcock & Wilcox boilers. In addition, there are two small gas-driven sets in the Canadian and Australian pavilions.

So much for the supply arrangements. Of the uses to which electricity is put, an enormous amount might be written. Interior and exterior lighting and decorative effects are the applications which will most strike the visitor, although there are innumerable instances of machine driving, and so on, scattered about the vast showground. There are about 2,000 arc lamps in use, of the Santoni flame type, the Maxim enclosed type and the Sunshine flame type, while no less than 100,000 incandescent lamps are used for decorative purposes, a good idea of which will be gathered from the illustrations made from photographs taken at night. These lamps have been installed on what is known as the "Fairyland" strip system, in which a twin rubber-covered cable is used, and special lamp holders fixed at intervals of about one foot. The feature of the system is that in these water-tight lampholders the connection is made without cutting the cable. The lamps are of five candlepower, and a section of 200 feet constitutes a circuit. For the interior work, the wiring is in screwed gas barrel up to the level of the roofs, but in the higher positions, insulated wires are run on porcelain insulators, the rules of the London County Council and the London Fire Brigade precluding the use of bare wires.

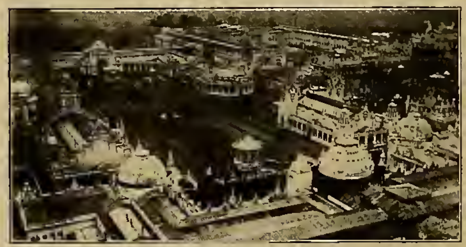
There are a fair number of electrical exhibits in the Machinery Hall, but they by no means constitute a feature, for the reasons already stated. The combined exhibit of the electric-lighting companies of London, which takes the form of a small



Westinghouse Gas Engine
FRANCO-BRITISH EXHIBITION

flat consisting of a hall, dining room, drawing room, bedroom and nursery, however, attracts a considerable amount of attention, although there is a danger that the luxurious furnishing catches the popular fancy rather than the electrical effects. In the flat are demonstrated the various uses of electricity in the home. For instance, in the hall there is a small hat iron and a cigar lighter; in the dining room a hot plate and a kettle; in the drawing room an afternoon tea kettle and a foot-warmer; in the bedroom a bed-warmer, a foot-warmer, curling-tongs heater, hair drier, shaving pot, kettle, hot-water jug, and a form of immersion heater used for heating water directly in the wash-basin or jug.

The real feature of the flat, of course, is the electric kitchen, which has been fitted up by Messrs. Rashleigh, Phipps & Co. of London. The cooking table, shown in the illustration, consists of a number of circuits, each controlled by two switches, giving three degrees of heat, pilot lamps being arranged to show which circuits are in use, and special arrangements are made to do away with all loose flexible cords. Fuses for the various circuits, together with main switch and cut-outs, are mounted in two recesses above the board, and an ammeter showing the total amount of current in use at any time is provided. In addition to the above mentioned circuits, which are intended for use with frying pans, sauce pans, kettles, etc., there is an electrical



A Bird's-eye View
FRANCO-BRITISH EXHIBITION

oven on an entirely new principle (the first of its kind ever constructed) in which, on account of the high temperature obtainable in the new form of element used, roasting and baking are performed with very much less expenditure of current than has hitherto been required. The various regulating switches and pilot lamps in this instance form a part of the oven, rendering it entirely self-contained and suitable for fixing in a kitchen quite apart from the other portion of the cooking table. On the top of the oven is fitted a cooking hot plate, a grill and a toaster, all fitted with the new high-temperature elements, as used in the oven. It is of particular interest to note that this is the first time an efficient and practical toaster has been exhibited. A small boiler, fitted with a tap enabling a supply of hot water to be obtained, completes the outfit.

MOTOR-MADE PARABOLIC REFLECTOR

Focusing the new astronomical telescope designed by Prof. Robert Wood of Johns-Hopkins University will be merely a matter of adjusting the speed of the electric motor which plays an important part in forming the reflector surface, which is the vital element of the telescope. The new speculum surface is the realization of an expedient which before this has been proposed for the forming of mathematical reflection surfaces, though with little success in the achievement. It is based on the principle that a liquid confined in a vessel in rotation, under the combined forces of the centrifugal throw and gravity, will dispose its surface in the form of a mathematically correct paraboloid of revolution.

In the present instance mercury is the liquid used, and its bright metal surface, accurately formed by the forces impressed upon it, is used as the parabolic reflector to concentrate the incoming rays into the focal plane of the eyepiece. A method similar to this has been tried in the casting of speculum metal reflectors by keeping the material in rotation, while it cooled and hardened.

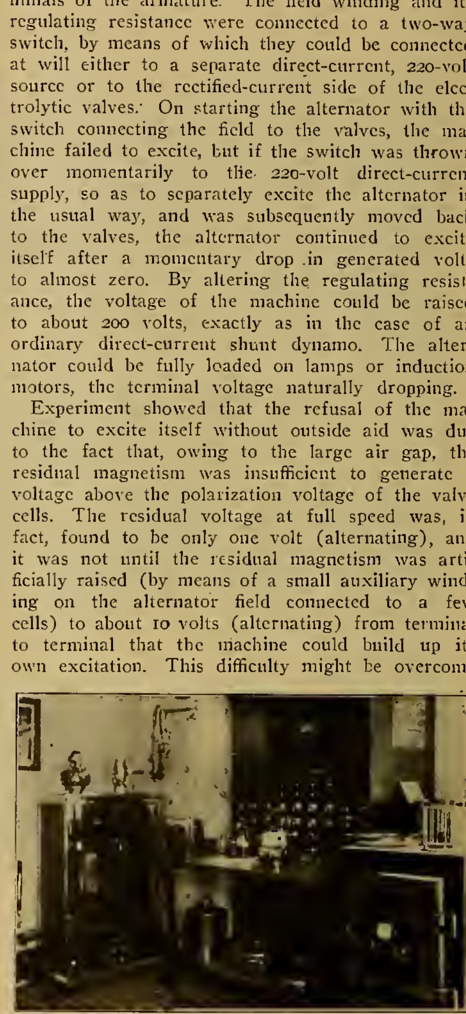
The difficulty heretofore besetting the mercury reflector was the presence of minute ripples on the surface, due to the jarring of the liquid by the propelling mechanism, but by careful attention to this feature the experimenters think they have avoided all free play of the rotating parts. Unfortunately for the astronomer's purpose the mercury reflector must be maintained in rotation about a vertical axis, since the resultant mercury surface is the product of the two components of the centrifugal force and gravity. For this reason the mercury reflector cannot be mounted on an axis to be swung at any vertical angle to follow a star, but must be mounted rigidly while some reflecting plane surface or mirror, driven by a clock or movable at will, must be used to reflect the desired field of view into the line of collimation of the reflector. A rigidly mounted eyepiece inserted between the mirror and the parabolic reflector is then used to magnify and examine the image.

The reflecting telescope is not limited as to size, as the refracting instrument must necessarily be, and the model under construction is of a comparatively large aperture, though if the plan proves successful very large reflectors will be built. The model will be mounted at the bottom of a cement-lined pit three feet in diameter and 15 feet deep. As noted before, no other provision for focusing than the speed control of the electric motor is needed with this mercury reflector.

ALTERNATOR SELF-EXCITATION THROUGH ALUMINUM CELLS

The self-excitation of alternators through aluminum rectifying cells was the subject of a series of laboratory experiments carried out by Mr. C. Limb and reported in L'Industrie Electrique. The first machine tested was a small three-phase generator for 10 kilovolt-amperes at 110-120 volts and 50 cycles. A battery of six aluminum-plate electrolytic valves was connected across the three terminals of the armature. The field winding and its regulating resistance were connected to a two-way switch, by means of which they could be connected at will either to a separate direct-current, 220-volt source or to the rectified-current side of the electrolytic valves. On starting the alternator with the switch connecting the field to the valves, the machine failed to excite, but if the switch was thrown over momentarily to the 220-volt direct-current supply, so as to separately excite the alternator in the usual way, and was subsequently moved back to the valves, the alternator continued to excite itself after a momentary drop in generated volts to almost zero. By altering the regulating resistance, the voltage of the machine could be raised to about 200 volts, exactly as in the case of an ordinary direct-current shunt dynamo. The alternator could be fully loaded on lamps or induction motors, the terminal voltage naturally dropping.

Experiment showed that the refusal of the machine to excite itself without outside aid was due to the fact that, owing to the large air gap, the residual magnetism was insufficient to generate a voltage above the polarization voltage of the valve cells. The residual voltage at full speed was, in fact, found to be only one volt (alternating), and it was not until the residual magnetism was artificially raised (by means of a small auxiliary winding on the alternator field connected to a few cells) to about 10 volts (alternating) from terminal to terminal that the machine could build up its own excitation. This difficulty might be overcome



The Electric Kitchen
FRANCO-BRITISH EXHIBITION

in practice by using steel pole pieces with considerable residual magnetism—it is not unusual to come across ordinary direct-current dynamos which give from 25 to 50 per cent. of their full voltage generated by residual magnetism alone. The rectified current produced by six electrolytic valves is only slightly pulsating, and can be made practically steady by introducing additional inductance in the form of low-resistance choking coils. The efficiency of the electrolytic valves is about 75 per cent., so that, from this point of view, the self-excitation would be about equal to separate excitation by means of a direct-coupled exciter or other separate source.

Mr. Limb carried out some similar experiments on a single-phase alternator, but, owing to the fact that in this case the rectified current passes through zero, the results were negative—no real building up of the field beyond two or three per cent. being obtained.

APPARATUS FOR PLOTTING RESONANCE CURVES

In high-frequency work, such as in radio-telegraphy or radio-telephony, the determination of the frequency and damping factor of the oscillatory circuit is an important feature in many cases. An apparatus to enable such determinations to be accurately made has been invented by Otto Scheller of Steglitz, near Berlin, Germany, and was recently patented in this country.

An apparatus and a method for determining the damping of electric oscillations have been heretofore employed, in which, by means of a resonance system which is calibrated upon periods of oscillations and by means of an instrument indicating in some form the maximum amplitude or the values of the integral of the energy oscillating in the system, resonance curves are plotted from which the damping may be calculated. On account of its simplicity such a method has been used for measuring the factor of damping and for comparing periods of oscillations.

Usually it was executed thus: The period of oscillation of the comparison circuit was steadily altered by altering the capacity or the self-induction, and the intensity of the current of the energy flowing in the circuit was indicated by means of an ammeter in which was utilized the heat generated in a resistance. In this way a resonance curve was plotted from which the sum of the dampings could be calculated, consisting of the damping of the circuit by means of which the other circuit was measured and of the damping of the circuit which was to be measured.

The apparatus hitherto used permitted but very rough measurements, because the damping of the circuit by means of which the measuring took place altered with each variation of the adjustment. Besides, with all arrangements of the apparatus heretofore employed the resistance of the connection or coupling not only altered or varied between the

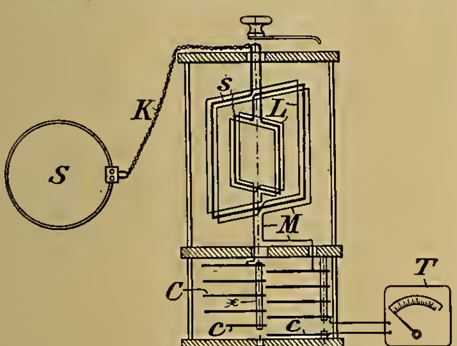


FIG. 1. DIAGRAMMATIC VIEW OF APPARATUS FOR PLOTTING RESONANCE CURVES

two circuits, but also between the circuit by means of which the measuring took place and the instrument indicating the intensity.

The object of the inventor is to provide an apparatus which in the simplest manner enables the most accurate measurements to be taken for every position within a very large range by always keeping constant the damping of the circuit by means of which the measurement is executed as well as the coupling or connection of the same with the system which is to be measured and the coupling or connection with the instrument indicating the oscillating energy.

Of the accompanying drawings Fig. 1 is a diagrammatical view of the apparatus, Fig. 2 is a plan of a part of the condenser used in the system of Fig. 1, and Fig. 3 is a diagrammatical view of the system illustrating the relation of the circuits.

The oscillation circuit consists of a continuously variable self-induction coupled with a continuously variable condenser C. The inductance device, in the form illustrated, comprises a stationary coil s and a movable coil L, so related, that by moving the latter with respect to s the inductance may be regularly and continuously varied. However, s may be the movable and L the fixed member, or the two coils may be relatively movable, within the invention. The plates of the condenser are so dimensioned that—while varying—the capacity of the whole system changes to the same extent as the self-induction. Thereby the damping of the circuit remains constant. At the same time, the instrument has a very large range, while it is not necessary to exchange any parts.

In order to effect corresponding movements of the coil L and the adjustable plates of the condenser so as to produce variations in the capacity and self-induction, the coil and the movable condenser plates are mounted on a rotatory spindle x, which is provided with a suitable index finger, cooperating with an appropriate scale on the casing of the instrument, and the spindle is preferably extended a considerable distance above the apparatus to form a handle of insulating material to neutralize the influence which the hand of the operator might have on the delicately adjusted parts.

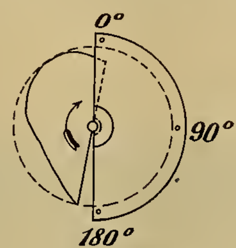


FIG. 2. PLAN OF CONDENSER IN APPARATUS FOR PLOTTING RESONANCE CURVES

To avoid the errors due to variations in the coupling or electrical connection between the coil and the condenser, the ends of the coil are positively connected to the fixed and movable members of the condenser, as shown.

The connection of the two circuits, to wit, the circuit to be measured and that of a measuring instrument, is effected by means of an auxiliary circuit K, comprising an open coil S, to the terminals of which is connected a pair of twisted conductors, which in turn are positively and permanently connected to the terminals of coil s, and it will be noted that this circuit K contains in itself no damping element. The system which is to be investigated is inductively connected with the measuring circuit by inserting into the field of the former the coil S of the circuit K which influences the measuring circuit, so that the relation of this coil to the measured circuit remains constant no matter how the measuring circuit is adjusted, and, inasmuch as the electrical connections between the twisted conductor, the coil S and the coil s are positive and substantially permanent, no errors such as would be due to shifting or changing contacts occur.

In order to produce a better inductive connection between the coil s and the coil L of the self-induction member of the instrument, and therefore to render the instrument more delicate and less liable to variation, the coils s and L are arranged as shown in Fig. 1. That is, each of the coils includes two members, one of which lies within the other and the corresponding members of each are disposed in inductive relation so that the several parts of the coil L always occupy the same relative position with respect to the corresponding parts of

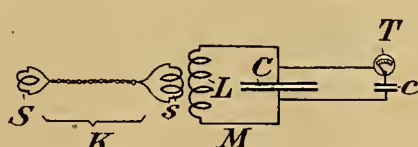


FIG. 3. CIRCUIT CONNECTIONS OF APPARATUS FOR PLOTTING RESONANCE CURVES

coil S so that the variation in the self-induction is constant. By suitably proportioning S the reaction of s may be neglected.

It will be noted that the inductive connection between the system which is to be measured and the measuring instrument is constant and that the connection between the coil L and the condenser is likewise constant and invariable. Therefore, in order to eliminate any other error which might occur owing to irregular connections, it is desirable that the connection between the ultimate measuring instrument, such as an electrometer for plotting the resonance curves, be likewise made permanent and invariable and not subject to constant change, such as is inevitable in apparatus employing sliding contacts.

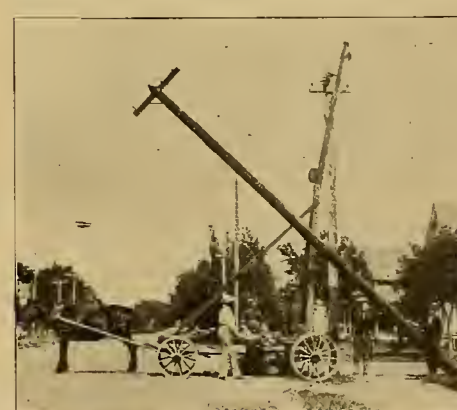
As an example, an arrangement is shown in which the voltage of the condenser is measured by means of an electrometer in order to plot resonance curves. This measurement is performed as follows: A part c is branched off from the capacity C, which part varies at the same ratio as the whole capacity and simultaneously therewith. Now the compensating currents in this branch are determined by means of a thermo-instrument T, or the like. The resistance R of T is preferably equal to $\sqrt{\frac{L}{C}}$, because in this case all the energy flowing in the branch is consumed.

If for some reasons the apparatus cannot be constructed in such a way that the coupling with the system to be investigated or the damping of the measuring circuit remains constant for every adjustment, the plates of c may be given such a form that the indicating instrument is always coupled with M in such a way that its deflections are such as if the conditions described above were prevalent.

A method for determining the frequency from the resonance curve is not entirely without objection, as theoretically the resonance curve of the voltage and of the current do not coincide; but the differences of these values are so small, that they cannot be measured. Of course the energy flowing in the oscillation circuit may be just as well determined by any known method. In order to determine the maximum amplitude a measuring spark gap may be directly connected to the condenser C, or it may be determined by means of a coil with spark gap in the magnetic field of the oscillating circuit.

In case the original measuring circuit be not large enough for measuring the frequency, a larger range may be attained by changing the single coils L and s from connection in series to parallel connection, or by making additions to the measuring circuit. Preferably, these additions consist of undivided multiples of the maximum values of the self-induction and the capacity of the measuring circuit, and they must have the same damping as the latter, so that all that has been said of the damping also applies to the combination. In order to avoid a sudden alteration in the coupling of the circuit which is to be measured and in that of the coupling of the indicating instrument, an appropriate part of the additions must be imparted to the couplings. The oscillating circuit may also be used for transmitting certain waves by inserting a spark gap into the circuit.

A HANDY DERRICK WAGON



A HANDY DERRICK WAGON

A handy arrangement of a derrick wagon for raising poles is shown in the accompanying reproduction of a photograph of a machine in which the mast can be lowered to pass under any wires. As will be seen from an examination of the picture the device consists of a braced A-frame mounted on the wagon and having its upper end pivoted to the middle of a mast which in the upright position is firmly anchored at its base. A stiffening cable is carried on the tension side of the mast. The mast can be lowered to a horizontal position to pass under any low wires in transporting the derrick wagon, and this feature has been found useful in raising poles through wires, branches of trees, etc. With the wagon illustrated several men can raise a 45-foot pole with ease by means of the windlass. This pole wagon is in use by the Iola (Wis.) Electric Light and Power Company and the photograph was kindly supplied by Mr. G. A. Frogner of that company.

WASHING FABRICS BY ELECTROLYSIS

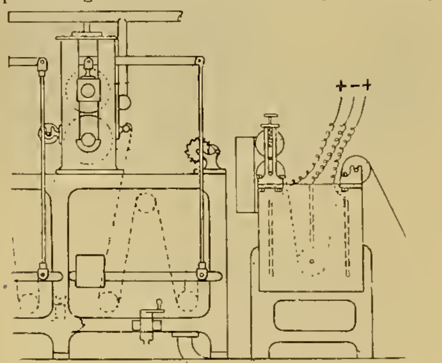
In certain processes of cloth finishing the operations of scouring and washing, after the material has been filled and bleached, require a long time, careful handling and a large supply of water. Moreover, through lack of practical means for recovering them, the oil and fatty acids or soap pass away with the waste wash-liquor, involving considerable loss. Often there are found in the cloth traces of fatty acids or soaps which produce spots and stains when the cloth is being dyed. The fact that the cloth is kept for a long time under a rolling action when in the bath also entails considerable wear and a very noticeable loss in weight.

The invention of a Frenchman, J. M. J. Baurot of the city of Roubaix, France, who was granted United States letters patent this month, provides for the treatment of the cloth by an electric current, which is used for penetrating, reducing and extracting the soapy film formed. Additional to this is the recovery of the fatty semi-solid magma resulting from the soapy matters extracted from the cloth.

The sketch accompanying shows the arrangement of the machine adapted from the inventor's drawing. The cloth is seen entering at the right over the roller and into the vat, where it passes between a set of electrodes. Leaving the electrolyte, the material passes between squeezing rollers and then through a tension device over idle rollers to the large rubber-covered squeezing roll at the left.

The electrolytic vat is kept filled with the proper amount of carbonate of soda or potash solution by replenishing as the electrolyte is consumed. By the action of the electric current passing between the electrodes, every fiber of the cloth is acted upon and there is produced a more complete saponification on the textile where before was only a coarse soapy film. Incidentally by the attraction of the freed salts with the elimination of gelatinous matters, waste fibers, dust and other small impurities which are kept in the yarn or material of the cloth and carried away with the salts thus formed, the action of scouring is completed, and when the cloth reaches the first pair of squeezing rollers their compressing action removes and throws back into the vat the soapy matter already solidified in a film on the cloth.

When the first compartment of the squeezing machine becomes filled with the soapy sludge the surplus sludge is led into the electrolytic recovery



WASHING FABRICS BY ELECTROLYSIS

vat. The pieces of cloth thus successively pass from the first compartment in the squeezing machine and then are submitted to a second scouring which absolutely insures the completion of the action. In this method there is no danger of incomplete scouring which has been the cause of many difficulties and annoyances in dyeing. Moreover, the method enables the time of scouring and washing to be shortened, for as a result of the facility with which the soapy matters are precipitated in the first compartment, the second compartment gets so little of such matters that the scouring of the cloth is effected well enough to allow the third compartment to be filled with a large supply of running water for washing. This is in most cases quite sufficient for the last rinsing of the cloth before being dyed.

The recovery of the fatty substances which compose most of the soapy wash-liquor led by the overflow from the first compartment of the squeezing machine is effected in the electrolytic vat connected to the dynamo. The alkaline salts are precipitated, the fatty acids depositing upon the surface of the electrode plates or rising to the surface of the liquor where they are easily removed. Such fatty acids still contain impurities which are removed by submitting them to the action of a press heated by steam, after which they come out clarified and pure enough to be either used again for making soap or sold to the trade. The treated magma gives out from 50 to 55 per cent. in weight of fatty acids.

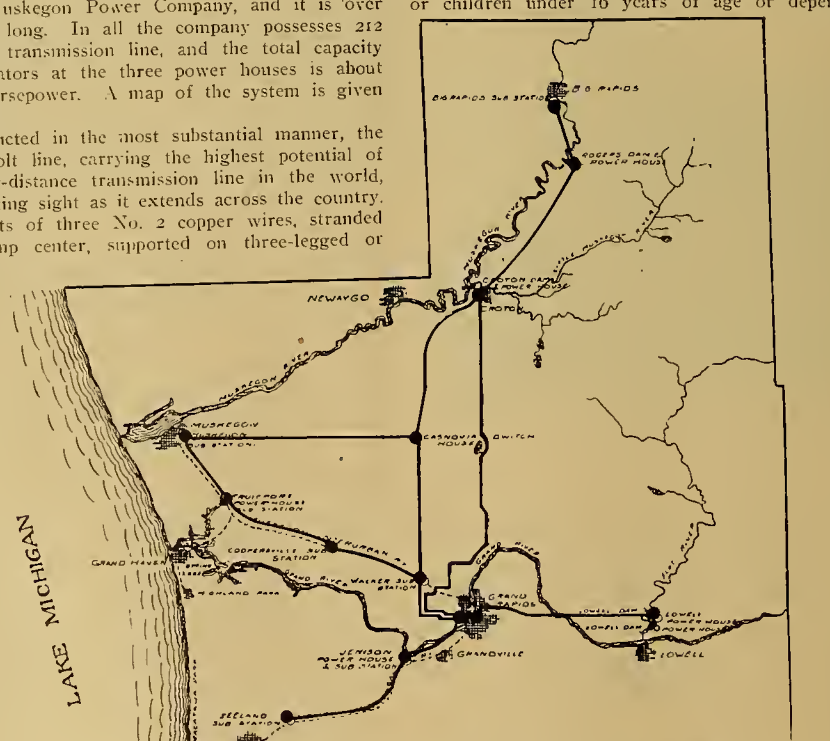
110,000-VOLT TRANSMISSION LINE AT NIGHT

About the middle of this month the 110,000-volt transmission line leading from the Croton Dam power house on the Muskegon River to Grand Rapids, Mich., was put into actual service for the

PHOTOGRAPH OF TOWER LINE AT NIGHT

first time. This particular line is a part of the extensive hydro-electric system of the Grand Rapids-Muskegon Power Company, and it is over 50 miles long. In all the company possesses 212 miles of transmission line, and the total capacity of generators at the three power houses is about 30,000 horsepower. A map of the system is given herewith.

Constructed in the most substantial manner, the 110,000-volt line, carrying the highest potential of any long-distance transmission line in the world, is a striking sight as it extends across the country. It consists of three No. 2 copper wires, stranded with hemp center, supported on three-legged or



MAP OF GRAND RAPIDS-MUSKEGON POWER COMPANY'S SYSTEM

triangular steel towers 53 feet high and spaced 500 feet apart on tangents. The towers are placed on large concrete anchors buried in the ground. From the mast-arms the wires are suspended by means of five-part series porcelain insulators. Each of the five disks of each insulator is 10 inches in diameter and is tested to 100,000 volts. Thus the complete insulator will stand a breakdown test of 500,000 volts, giving a large factor of safety.

On dark, cloudy nights the line is luminous, emitting a bluish glow, due to the brush discharge at the extremely high potential which is employed. The accompanying half-tone illustration is a reproduction of a night photograph resulting from an exposure of two hours and ten minutes. The picture was made for the Power company and was distributed among the delegates to last week's Grand Rapids convention of the Michigan Electric Association, who were escorted to the main substation of the company in that city, where the 110,000-volt line, as well as the 72,000-volt line, terminates, as can be seen by the map. The step-down transformers, reducing to 19,000 and 6,600 volts, are of enormous proportions, and the delegates were greatly interested. The picture also illustrates the five-part insulators, while one leg of the steel tower may be seen at the right-hand side of the picture.

COMPENSATION FOR INJURIES

The act of May 30, 1908, entitled "An act granting to certain employes of the United States the right to receive from it compensation for injuries sustained in the course of their employment," which came into effect on August 1, 1908, is a measure of considerable importance. Under previous laws, compensation in case of injury is paid to employes in the railway-mail service and in the life-saving service. The new law applies to persons employed by the government as artisans or laborers in arsenals, navy yards, river and harbor construction, fortification construction, hazardous employment in the Reclamation Service, hazardous employment under the Isthmian Canal Commission and in government manufacturing establishments.

Compensation will be paid only for such injuries to an employe as occur in the course of his employment and cause inability to pursue his employment for more than 15 days. Compensation is not paid if the injury is due to negligence or misconduct of the employe injured. The act applies only to injuries received after July 31, 1908.

The compensation consists of a continuance during the period of disability, but not over one year, of the same pay which the employe was receiving at the time of the injury. If the employe is killed by the accident or dies from the results of the injury received and leaves a widow or children under 16 years of age or dependent parents, the same amount of compensation is paid to these dependent relatives until the completion of the 12 months' period.

No compensation will be paid either for injury or death unless the persons entitled thereto make application to the secretary of commerce and labor.

MICHIGAN ELECTRIC ASSOCIATION

In all respects the fifth annual convention of the Michigan Electric Association held in Grand Rapids on August 18th, 19th and 20th was a notable success. The attendance was even larger than had been expected, running over 200, including the ladies and the electrical people of Grand Rapids who registered at the secretary's office. The character of the papers read was of a high order, and the discussions were useful and practical.

One important result of the meeting was the decision to amend the constitution to admit manufacturers and supply dealers as associate members. This was done in accordance with a recommendation in President Hillman's address, which was outlined in the Western Electrician of last week. There was some opposition to this departure from the policy which the association had hitherto followed, but after a thorough discussion in executive session on Wednesday the change was agreed to by a decisive vote. There was a good attendance of supply men, who, indeed, outnumbered the central-station men, but only a few exhibits were shown, and these mainly of small domestic electrical appliances.

Cordial praise is due the electrical interests of Grand Rapids for the profuse and hospitable entertainment which was extended to the visitors. Business sessions were confined to the morning hours, and in the afternoon and evening relaxation was sought in various ways. But these "side features" were not without distinct educational value; for one of them was a lecture by Dr. Steinmetz, and others were trips to places of electrical interest, including the crowning feature of Grand Rapids' electrical accomplishment, the 110,000-volt transmission line of the Grand Rapids-Muskegon Power Company, which is characterized without doubt by the highest commercial voltage used anywhere in the world.

A brief report of the proceedings of the opening day (Tuesday, August 18th) was given in the Western Electrician of last week, and the conclusion of the report is presented herewith.

Opening Business of Wednesday

At the opening of Wednesday's session the first business was the announcement by President Hillman of these committees:

Nominaion of officers—George D. Westover, Cadillac; R. W. Hemphill, Jr., Ann Arbor; F. E. Koehler, Grand Rapids.

President's address—H. A. Mott, Jackson; H. A. Chase, Hart; George D. Westover, Cadillac.

The president again urged the necessity of increasing the membership of the association, and while he was speaking Dr. Steinmetz entered the hall. The appearance of this distinguished visitor, who was conducted to a seat on the platform, was greeted with hearty applause.

E. F. Phillips of Detroit presented a report of progress from the insurance committee. William Chandler of Sault Ste. Marie said that this subject was of much importance. Individually, member companies can accomplish nothing, but the association can do much. Insurance premiums on electrical properties are higher than they should be. The committee was continued.

Campaigning for Power

E. L. Crosby of the Detroit Edison Company read a short but interesting paper entitled "Campaigning for Power." It is presented elsewhere in this issue of the Western Electrician. This was followed by a description by Arthur C. Harris of the Grand Rapids-Muskegon Power Company of an interesting electric power installation in the woodworking plant of the Grand Rapids Hand Screw Company. Steam is used only in dry kilns, and a steam engine is not considered necessary. Mr. Harris gave a table showing that the monthly cost for steam operation of this plant would be $442.50, compared with $352.50 for electric operation.

A. L. SEARLES,
Chairman Entertainment Committee

Mr. Chandler opened the discussion on uses of electric power. He said that it was hard to get woodworking establishments on central-station circuits because they make their own fuel and require steam for drying purposes. Nevertheless, in the Soo the central-station company supplies nearly all the woodworking establishments in town. The speaker advocated trial use of motors. This proves the good faith of the lighting company.

Mr. Crosby pointed out that woodworking plants could usually sell their shavings and wood refuse for more than the cost of coal to run the plant. As for drying, this can be done by low-pressure steam, thus doing away with the wages of an engineer.

Miss Sheridan of the Detroit Edison Company spoke briefly and called on Mr. Biggs of the same company, who deprecated the practice of attaching motors directly to shafting, as they are thus required to run at a higher speed than is usually necessary, thus wasting power. He also said that sometimes a mistake was made by putting the number of compensators on a board instead of having each compensator near its individual motor, saving the time of the attendant. William Constable of Grand Rapids described a pumping plant for ditch drainage under rather unusual conditions. Mr. Chandler also spoke of similar installations at the Soo, particularly for contractors building a canal for the government. One great advantage of electric motors in this class of work is the portability of small electric pumps. There is also a great advantage in using motor-driven air compressors for drilling. In the case of the big canal job at the Soo the contractors are saving $7,000 over what a steam plant of the same capacity would cost. Of course, the motor business is highly desirable for the central-station company, which at the Soo has a heavier load during the day than at night.

H. W. HILLMAN,
President Michigan Electric Association

Dr. Steinmetz was then introduced. He said that electric motors are not perfect, but they are pretty good. One can do most anything with a direct-current motor, and the induction motor is still better, because it is simpler, but it has the disadvantage of constant speed. Variation in speed is seldom needed, but where it is wanted it is wanted very much. In such cases multi-speed motors are used by cutting in or out some of the poles; but a fine degree of speed regulation is still needed. "I expect to see this fine degree of speed regulation in induction motors in a short time," said the speaker. "Electric motors are numerous, but probably only three or four per cent. of the power applied in this country is electric power. We must look to waterpower and the electric motor to do the world's work in the future. Coal will not last forever—perhaps 50 years, perhaps 200 years. Coal consumption has more than doubled in the last 10 years. The development of waterpowers is the hope for the future." Following along this train of thought, Dr. Steinmetz said that it was very instructive to see the blue glow of the 110,000-volt transmission line coming into Grand Rapids and to hear its hissing. He said that he had been up at midnight the night before to look at the wires, which in the dark can be distinctly seen to give off a brush discharge. The speaker gave an interesting résumé of electric power development from the time of the Frankfort-Lauffen experiment. He said that the Grand Rapids-Muskegon Power Company had the record of possessing the highest voltage transmission in commercial operation. He hoped to see the day when 100,000 volts can be taken into the backyard of anybody who wants to buy power.

Prof. E. E. F. Creighton of Union University, Schenectady, whose remarkable work in investigating lightning phenomena is well known, was introduced and spoke briefly on this subject as allied to power development. He said that lightning protection is becoming just as definite as the rating of a motor. He spoke of the aluminum-cell arrester and paid a graceful compliment to Dr. Steinmetz as the dean of this work.

Alex Dow of Detroit paid tribute to the work of Steinmetz on the induction motor and the practical work of Mr. Chandler at the Soo in sensibly adapting existing equipment to power requirements. The power salesman must be a man who knows about power requirements. He must follow up the installation and see that it is doing what he said it would do. He should straighten out gas and steam installations, so that they may be made more economical as such. Establish a reputation for truthfulness, even if it does not directly benefit one's own pocket. Then, when the salesman says that electric power should be installed, the customer will believe him. Mr. Dow spoke pleasantly of the work of Miss Sheridan and Mr. Biggs. "Put yourself in the customer's place," he said; "that's the essence of practical salesmanship. Convince him that his ends may be reached better by other means than he is now using."

An Honorary Member Elected

At this stage in the proceedings President Hillman announced that the executive committee had proposed the name of Dr. Steinmetz as an honorary member of the association. On motion of Mr. Dow, seconded by Mr. Chandler, this action was confirmed, and amid loud applause the secretary cast one ballot making Charles Proteus Steinmetz an honorary member of the association.

The Contractor and the Central Station

Guy Lewis of Grand Rapids read a paper entitled "Ideal Relations Between the Central Station and the Contractor." He said that the central station should do no construction work, except on very small jobs, and the contractor in turn should use his influence in every way to create satisfied customers for the central station.

Mr. Chandler said that, theoretically, Mr. Lewis' paper was all right, but in some cases the central-station companies must do contracting business. He detailed the situation at the Soo, where the company has had experience with both methods of handling the problem. He said that if a fire occurs the contractor is not blamed, but the electric-light company is. The contractors may make prices for wiring so high as to be antagonistic to the interests of the lighting company. Generally in small towns the central station must retain some control of the contracting business and also of the sale of heating and other devices.

Mr. Constable of Grand Rapids said that in that city the contractors and the central station co-operated to establish a low price to customers for electric flatirons.

Electric Signs

John Vandervliet of the Grand Rapids-Muskegon Power Company told of the "Value of Electric Sign Advertising" in a short paper. He said that about three years ago there were not more than three electric signs connected to the central-station system of Grand Rapids. At the present time there are over 120 large signs and a number of smaller ones. The total number of sign lamps is nearly 20,000, and from these the central station will realize $19,200 annually.

Supply Men Admitted

Just before adjournment Mr. Mott presented the report of the committee on the president's address, indorsing the president's recommendations. An executive session of the association followed, and after an animated debate it was voted to create a class of associate members, to which the supply men will be eligible.

Dr. Steinmetz Lectures on Lightning

The event of Wednesday evening, and in point of interest and attendance of the convention, was the lecture by Dr. C. P. Steinmetz on "Lightning Phenomena." Dr. Steinmetz was greeted by an audience that more than filled the convention hall. He was introduced by President Hillman, and he illustrated his address by lantern-slide pictures. The lecture was a popular exposition of atmospheric electricity, brought down to include the latest investigations of the subject by perhaps the greatest living authority—the speaker himself.

DR. CHARLES PROTEUS STEINMETZ

The lecturer said that the lightning rod is even

(*Continued on page 156*)

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - . - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

READERS of the Western Electrician will recall, perhaps, that the Verein Deutscher Ingenieure (Society of German Engineers) announced last fall that work on the Technolexicon—the great technical dictionary—had been abandoned. The work turned out to be much more expensive than had been expected, and it was found that the pecuniary means available to the society for the accomplishment of the task within the allotted time were not sufficient for the purpose. But we now learn, through Mr. Richard Guenther, the United States consul-general at Frankfort, that the executive board of the society has made strenuous efforts to take up and complete this valuable work, and has succeeded in obtaining therefor the aid of the federal government of Germany and of the ministry of education of the Prussian kingdom.

This is gratifying news, for it is to be hoped that the important work will now be carried to completion, to the benefit of the engineering fraternity throughout the world. The plan is that of a universal technical dictionary in German, French and English, and work was begun on it in 1901. In 1905 it was reported that about 2,000 firms and individual collectors throughout the world were assisting in the task and that 2,700,000 word-cards had been collected. It would be a great pity if this effort and material were wasted, and we hope that the German society will carry the project—worthy of the best traditions of engineering—to complete success. Perhaps it will be wise to restrict the original scope of the enterprise somewhat, so that the completed work may not be too bulky and elaborate for a practical book of reference. Then, too, some method should be devised to keep the work up to date, for in electrical engineering particularly, new words will be coined even while the volume or volumes are going through the press, while others are becoming obsolete. The question of standardizing terminology also enters prominently into the preparation of a lexicon such as this. But these points have been considered, no doubt, with care by the German society, which deserves respect and gratitude for its fine effort.

LAST DECEMBER the Western Electrician called attention in an editorial to the possibility of combining the advantages of electric heat and the "fireless cooker." At the Chicago Electrical Show of last January a device partaking of some of the characteristics suggested was exhibited, although its existence was not known to the writer of the editorial article a month before. The subject was further enlarged upon in a paper on "Electricity and the Fireless Cooker," prepared by Mr. John A. Gronberg of Grand Rapids for the convention of the Michigan Electric Association, held at Grand Rapids last week.

The author of this paper points out one great advantage possessed by the use of electric heat with the fireless cooker: "It is possible to use electricity in connection with the fireless cooker with proportionately greater economy in the use of the fuel than in the use of gas, oil or alcohol. The reason why the economy of fuel is proportionately greater through the use of electricity is because it is possible to utilize literally practically every heat unit generated by the current. The coils are introduced in the steatite radiators, holes being drilled therein, and while the radiators are being raised to the required temperature, the fireless 'oven' being closed, there is no loss of heat by radiation while the radiators are heated. Inasmuch as no gas, oil or alcohol flame can be maintained in an insulated chamber or 'oven'—lacking the oxygen—there must be a loss of heat while heating the radiators, of varying but very considerable degree. When the electric coils have raised the temperature of the steatite radiators to the necessary temperature, the current is turned off, and the insulated oven continues to maintain the baking temperature, through the radiators, for one, two or three hours."

There is no doubt that these efforts are tending in the right direction, and the subject is worthy of careful consideration. If electric cooking can be made cheap by combination with the fireless cooker, it is obvious that the demand for electric current will be greatly increased. But of course to be available in the ordinary kitchen the apparatus should be as compact and simple as possible, preferably consisting of one self-contained electric stove with various heat-insulated compartments. And there are no doubt practical difficulties to be overcome before this desirable simplicity is reached.

SOLDERING ALUMINUM presents difficulties which have to be met in the growing use of aluminum wires in electrical transmission. The soldering of this metal does not succeed with the same soldering salts that are used for other metals. It was thought by many that such salts could not be used, and inventors have tried to produce compositions of varying character to be used without the salts. But when such compositions were used without a liquid it was found that alumina was formed, which prevented the soldering or welding from taking place. A German inventor, Otto Nicolai, says that he has discovered a very good liquid for welding the metal, as he considered that the process could not be accomplished without a liquid. But the difficulty could not be solved without the use of a metallic solder or alloy at the same time, and after some time Mr. Nicolai found a good soldering alloy which has the same melting point as the metal itself. It is asserted that there is now no difficulty in soldering aluminum. The metal is first cleaned and then the places are brushed over with the liquid. Upon the joint is poured the solder in the melted state mixed with the soldering liquid. It penetrates easily between the two pieces, even if the surface is an inch square or more. The joint is said to be very strong. Plates which are soldered one upon the other can be rolled or hammered, and the soldered part does not suffer. This process is now said to be in use in Germany at the Imperial shipyards at Kiel and at the powder works of Spandau, and the results are reported as good.

MICHIGAN'S electric association is one of the more youthful of the state associations, but last week's convention at Grand Rapids demonstrated that it is one of the most flourishing and vigorous of the brotherhood. The membership has shown a remarkable increase—a fact partly due, of course, to the comparatively large number of central-station men in Detroit and Grand Rapids, in which cities the operating companies evince a hearty interest in the association. As the result of a recommendation of President H. W. Hillman it was decided to create a class of associate members, to which manufacturers and supply dealers shall be eligible. This move will undoubtedly serve still further to increase the membership and to enhance the usefulness of the association. The programme was a specialized one, relating mainly to tungsten lamps, power applications and new-business getting, particularly in the line of electric heating. Dr. C. P. Steinmetz delivered a fascinating and instructive lecture on "Lightning Phenomena," and there were various inspection trips to up-to-date plants, including Grand Rapids' crowning electrical attraction, the 110,000-volt transmission line. The purely entertainment features were also greatly enjoyed.

In his annual address the president showed that nearly $50,000,000 of capital is invested in the electrical industry in the state of Michigan. Electric motors of more than 100,000 horsepower help to turn the wheels of industry throughout the state. Turning to the new metallic-filament lamps, returns from 75 electric-light companies in Michigan indicate that they have purchased nearly 15,000 tungsten lamps. In waterpower transmission and in electric heating the state is also conspicuous, and President Hillman was amply justified in saying that "the representative companies of this association have excelled in all that is electrical, placing the state of Michigan in a position, electrically, upon which we may look with pride."

ASSOCIATION OF CAR LIGHTING ENGINEERS

The Association of Car Lighting Engineers was in session at the Grand Pacific Hotel, Chicago, August 24th and 25th, at a special meeting called by President Farrelly for the transaction of some routine matters of business and organization, and for an informal discussion of problems associated with the lighting of railroad cars by electricity. The constitution was accepted, and the date set and a programme arranged for the association's first annual convention, which is to be held in Chicago during the week of November 16th. The rest of the sessions were given over to talks and discussions by members who related their experiences and conclusions with various apparatus and systems used in the electric lighting of trains.

The Association of Car Lighting Engineers was organized May 21st at Ogden, Utah, at a called meeting of the electrical engineers and superintendents of a number of the railroads which have taken up the car-lighting proposition. Its object as set forth in the constitution is the advancement of knowledge pertaining to the principles, design, construction, maintenance and operation of railway-car-lighting appliances, by discussion, investigation and reports of the experiences of its members, and to provide a means of exchange of ideas, that car-lighting practice may be systematized and improved.

Membership in the organization is classed as active, associate and honorary. The active membership is limited to persons directly or indirectly in charge of electric car lighting on any railroad in the Americas. The class of associate members is open to any person who has been engaged in car-lighting work for a period of over one year on these railroads, upon the recommendation of his superiors. Representatives of companies in the railroad supply business are also eligible to associate membership. The officers of the association are as follows: President, A. J. Farrelly; vice-presidents, E. M. Cutting and A. J. Collett; secretary and treasurer, G. B. Colegrove; executive committee, H. C. Meloy, A. C. Terry, G. W. Murray and O. W. Ott.

In opening the first session of the meeting on Monday afternoon, President A. J. Farrelly made a short address enunciating the purposes of the association, which he declared to be entirely educative to the individual members and with a view toward co-operative help. He laid emphasis on the good to be gained by a free discussion on practical points among the members, in which each should lay his best idea before the assembly, arguing that, for the individual loss of unique possession sustained, every member would be amply recompensed by the wealth of valuable material thus collected for the use of all. The routine business of the afternoon included the adoption of the constitution, which was accepted by the association, after extending the qualification for membership, formerly limited to the United States and Canada, to include officials of Mexican and Central American railroads.

The work of the first annual convention, which will occupy the week of November 16th, was at this meeting divided up into a number of classes and committees appointed to report on their subjects as follows: Car illumination, H. C. Meloy; storage-battery maintenance, F. R. Frost; head-end systems, C. R. Gilman; axle-lighting systems, Chester Terry; train connectors and wiring, Alex McGarry; straight electric lighting (without auxiliary systems), C. W. Bender; straight storage-battery systems, W. E. Ballontine; organizing and systematizing, E. W. Jansen. For the convention meeting Mr. W. L. Bliss also has promised a paper on "The History of Axle Lighting in the United States."

Informal technical discussion was opened on Tuesday morning by Mr. F. R. Frost, electrical engineer for the Santa Fe, who compared the advantages of the use of rubber jars and lead-lined tanks for storage batteries. Mr. Frost has found that rubber jars serve the purpose satisfactorily when properly handled. He spoke of the ease of replacement of these cells and mentioned that no lead-burning apparatus or expert skill is required to effect a simple substitution. Mr. C. W. Bender gave as the experience of the Pennsylvania Railroad that lead-lined tanks had proved half as expensive as rubber jars. In fact, his road now uses only the lead-lined tank, having some 16,000 cells in use. He explained that the lead cell has been found more dependable because at the worst it will develop only a slow leak which permits the use of the lights at partial efficiency until the terminal is reached, while the rubber jar is likely to break and lose its entire contents, recording a complete and sudden failure. Since the Pennsylvania road has adopted a policy of taking out all gas and auxiliary methods of lighting when the electric system is installed in a car it becomes especially important that the service be partially maintained, even if impaired.

Mr. C. R. Gilman of the Chicago, Milwaukee and St. Paul reported that his rubber jars had outlasted the elements, while with lead tanks there had been trouble from pitting. An explanation of the latter phenomenon was given by a battery manufacturer's representative present, who ascribed the trouble to moisture getting into the wood of the tank, and freeing acetic acid, a soluble organic compound, which attacks the tank lining rapidly, forming lead acetate or sugar of lead, and producing the action of pitting. This can be guarded against, he explained, by thorough painting of the wood.

The size of the cell to be contained in the jar was another factor admitted, as the discussion of container materials proceeded. With an unvarying thickness of the rubber jar for different sizes, the strains in the larger batteries become excessive. Mr. Frost has had success, however, with a 17-plate cell of his own design, using 3/16-inch rubber for the sides and a thickness of one-fourth inch for the bottom. The rim of the jar is reinforced by an additional thickness of rubber. The comparative fragility of the rubber container is testified by the practice of a standard manufacturer of storage batteries, who refuses to ship the elements assembled in the jars, though all of the lead-lined cells are freighted so set up. Summing up the whole discussion of storage cells, the general agreement of opinion was to the effect that more care must be instilled into the men who handle them, subjecting them to unnecessary rough treatment, which is often more destructive than the ordinary conditions of train travel.

The question of a standard voltage for car lighting was next taken up. Present practice ranges over 12, 25, 32, 64 and 110 volts, and the need of a universally accepted standard is clearly needed. What this shall be the engineers were not all agreed, though most admitted that the standard central-station voltage of 110 was hardly necessary. The difficulty in charging from the ordinary small town's 110-volt generating equipment was urged against the same potential for car lighting. Mr. Gilman, however, took his position in favor of the high voltage, arguing that an increased number of smaller elements which would be lighter, would decrease breakage. Mr. Bender admitted this argument for head-end systems, but advised 64 or 32 volts where the train might be split, and each car required to carry its own cells. The Pennsylvania uses a standard equipment of 32 cells per car. Mr. Frost has found a similar voltage satisfactory, but believed the 30-volt systems have the objection of requiring a large amount of copper in car wiring, with good contacts an important item. Mr. McGarry suggested that the introduction of tungsten lamps would be a determining factor in future voltage considerations, and this was the keynote of the afternoon's discussion when the comparative advantages, efficiencies and characteristics of carbon, tantalum and tungsten lamps were considered.

The tungsten lamp is destined to play as important a part in train lighting as in stationary illumination. While early experiences with the new illuminant had been disappointing in the matter of the blackening of the globe, manufacturers have now produced a successful lamp, which seems to be giving satisfaction. The application of the tungsten lamp to a system where the regulation must be rather large was illustrated by an incident, reported at the meeting, in which the regulating mechanism of a car carrying both carbon and tungsten lamps had been damaged in a smashup, impressing the full generator potential, 80 volts, on the 60-volt lighting system. As a result every carbon lamp was burned out, although only one tungsten suffered from the abnormal voltage. While the tungsten lamp is a delicate apparatus, the damage which it suffers in railway cars is accountable rather to the careless attention of the car cleaners and in handling, than to the vibration of the train's movement. The tungsten lamp may be expected to decrease the weight of storage batteries and to serve admirably on the low-voltage systems of car lighting.

The necessity of a universal form of train connector was urged by all the engineers present. The difficulties presented in making up a special train with the present varied styles which may be encountered, can be remedied only by some authoritative organization considering existing and suggested connectors and selecting the best for universal use. To this end all the train-lighting engineers were invited to bring samples to the convention in November.

The meeting closed with votes of congratulation to the officers and to the association on the prospects of a successful organization of which the Car Lighting Engineers show evidence of becoming. The attendance at all of the meetings was large and interested, and the majority of the engineers present took part in the discussions, relating their experiences.

Among the entertainment features tendered the members of the association was a luncheon at the Union League Club, given by the Central Electric Company, and a well-appointed dinner at the Grand Pacific Hotel, where the engineers were the guests of the Messrs. Kennedy of the Consolidated Railway Electric Lighting and Equipment Company.

Among the railroads represented at the meeting were the following: C., R. I. & P., F. S. Hutchison, W. E. Ballontine; Illinois Central, G. B. Colgrove, E. W. Jansen, J. C. McElree; A., T. & S. F., F. R. Frost; C., R. I. & P., George H. Scott; C. & N. W., A. J. Farrelly; "Soo" Line, A. C. Terry; Pennsylvania, W. E. Kershaw, C. W. Bender; L. S. & M. S., H. C. Meloy, E. A. Humphrey; C., M. & St. P., C. R. Gilman; C., B. & Q., F. M. Gary; N. Y. C. & H. R., Alex McGarry; M. P., R. W. Massey; C. G. W., G. Shirk; G. R. & I., F. P. Sherbondy.

MUNICIPAL ELECTRICIANS AT DETROIT

The thirteenth annual convention of the International Association of Municipal Electricians was held at the Hotel Ponchartrain, Detroit, Mich., on August 19th, 20th and 21st. The attendance was large and included, almost without exception, the entire membership list of the association, which is made up of the city electricians and superintendents of municipal telegraphs of about 150 cities and towns.

The visit of the municipal electricians to Detroit was made the occasion of an address of welcome by Mayor W. B. Thompson, and many entertainment features were provided for the visitors between the business sessions, which occupied several hours morning and afternoon. The ladies of the convention were taken on automobile trips and boat rides during the hours of the sessions. Louis Gascoigne, superintendent of fire telegraph for Detroit, headed the entertainment committee, which served graciously.

Among the papers read before the convention were those of Mr. Clarence George, superintendent of fire-alarm telegraph at Houston, Tex., Mr. Jerry Murphy, superintendent of police telegraph at Cleveland, Ohio, and Mr. Bernstein of the Leeds-Northrup Company on "Simple Methods of Fault Location."

OHIO ELECTRIC-LIGHT CONVENTION

(By telegraph.)

Hotel Victory, Put-in-Bay, Ohio, August 25.—What promises to be a very successful convention of the Ohio Electric Light Association was begun here this afternoon with an attendance of 150, which will be much increased later. Former President H. Engel presided in the temporary absence of President F. M. Tait.

Papers by W. M. Adams of Elyria, B. H. Smith of Lexington and B. H. Gardner of Dayton were read. All related to internal-combustion engines for central-station work, and an interesting discussion of this type of prime movers followed. While there was some dissent, the general trend of opinion appeared to favor the gas engine for its fuel economy and convenience of operation. A full report of the convention will appear in next week's issue of the Western Electrician.

W. E. K.

SELLING ELECTRICITY

Under this heading will appear, from time to time, articles, suggestions and examples which will be of assistance in the constant effort to increase the existing demand for electric current and to create new demands.

CAMPAIGNING FOR POWER[1]

By E. L. Crosby

In undertaking to secure a day load for a central station the first requisite is a system equipped and operated to give reliable and efficient service; the second, rates low enough to compete with steam costs—for, in introducing central-station service in a community, few manufacturers will be found willing in the beginning to put a money value on the superiority of electric power. As the load factor of a station improves, however, such rates, that are really too low from the central-station standpoint, become gradually more profitable; and third, an intelligent and energetic selling force, having faith in the honest policy of the company they represent and a belief that central-station service will prove a benefit to 90 per cent. of the manufacturers in their community.

The first step in the campaign is to learn the possible business within the limits of the territory reached by your lines. Among the total number of power users will be found some plants that are operating under modern conditions and with a very high percentage of efficiency. A second class is the plant in fair condition that is obtaining a moderate economy in operation, and where central-station service would doubtless mean an improvement in operation, but no actual financial saving would be effected by making the change. But the majority of plants will be found to be operating with wasteful mechanical equipment, high labor costs and some in insanitary conditions. There are further the small plants, the output of which is so little and the hours of operation so few that individual power production is ridiculous. The last two classes are those on which to spend the greatest effort to secure the business. The second class will come gradually as the superiority of central-station service is accepted, and the first class will either eventually be the part of small percentage of power that we cannot secure or succumb to the superiority of central-station service and be willing to pay for it.

The first and most essential movement in dealing with the prospective customer is educational. He will ask the station representative the cost per horsepower per month and insist upon estimating that this figure, multiplied by the capacity of his present gas or steam engine, or by the maximum requirements of all his machinery, will be his cost per month on central-station service. If this were true, electrical drive would not have experienced the phenomenal growth that it has in this country in the past decade, and it is up to the power solicitor to convince the prospect of the fallacy of his premises.

Actual tests have shown that the load factor of machine shops and woodworking plants, which constitute a large percentage of the average central-station load, is below 35 per cent.; consequently the manufacturer who installs, say, 100 horsepower in motors, will find that the load which determines the rate which he pays will be practically one-third of the capacity necessary in steam or gas drive.

The successful solicitor should understand indicating steam engines as in this way he is able to determine the actual effective power required as well as the friction loss which might be excluded by the use of motors and by this means arrive at a very close estimate on the cost of operation by his service.

It is necessary that he be familiar with the efficiencies of various gas engines under different load conditions, as by checking the gas consumption of the engine while running it is a very simple matter to figure the average load and hence make a comparative estimate.

In a new installation, however, it is necessary that the solicitor have a thorough knowledge of the power requirements of the various machines under the requisite load conditions. In this connection a record of tests taken on the various motors on the system together with description of the class of work on which they are employed will prove invaluable as a reference.

In competing with gas engines the solicitor will find that his prospective customer very seldom figures any cost other than the gas bill sent him each month, and here it is necessary for him to display in as impressive a way as is possible the cost for lubrication, cooling water, repairs, attendance, etc., which will in most instances amount to $1 per horsepower per month. These items are usually lost sight of in the factory not having a regular system of figuring power costs.

1. A paper read before the Michigan Electric Association at Grand Rapids, August 19, 1908. The author is connected with the Detroit Edison Company.

The steam user very often neglects to figure such items as depreciation, interest, etc., and when these things are forcibly brought to his attention his ideas in regard to his cost for power are likely to change.

Added to these savings, which may be figured by having access to the customer's costs, there are many other features which at first thought appear to the average power user as phantasmal but which he eventually appreciates are of solid value. These features, such as reliability—not being dependent on one unit for service, flexibility—ease with which additional power may be installed at small expense, increased output—owing to constant maintenance of the speed of the maximum efficiency (this feature also effecting better finish ot product), the elimination of noise, dirt, smoke and the various annoyances that arise from any isolated power plant; persecution by smoke inspectors (very acute in some localities), and last but not least, that "peace of mind which passeth all understanding," which invariably permeates the soul of the man whose shop is operated by central-station electric service.

Very little trouble should be experienced in securing the business of the small steam user, say up to 50 horsepower. The writer has, in several instances, secured business where the entire shop, after the change, was operated for less than the engineer's salary alone. In one plant where the engineer was paid $60 per month and coal consumed cost $20 per month, the shop was driven by one motor for less than $25 per month, and the owner sold $10 worth of shavings formerly burned under his boiler. Of course this is an exceptional case, and the man had contemplated electric drive for years, but hesitated for fear the service would prove too expensive.

To demonstrate to the prospective customer that motor drive will prove economical in his plant a trial installation is often very effective. Ninety per cent. of the people using power are willing to pay a little more for central-station service than for any other form of power after they have once had experience in its use; and if the prospective customer can be induced to allow an installation for 30 or 60 days free of expense other than for current consumed, with the understanding that the apparatus will be removed in case of failure to satisfactorily operate his shop, he will usually be ready to sign a contract at the end of the trial period.

Until such a time as the central station creates a demand for power, few contractors or supply dealers will be found ready to make an investment necessary for an adequate motor stock.

When the Detroit companies started out seriously to secure power business, a stock of motors was purchased from which we loaned, rented and sold motors to power customers. After about 18 months one of the local contractors, recognizing the business to be had in this field, secured the agency for one of the standard makes of motors and put in a good stock. Several others have followed suit and today the local contractors are able to take care of the motor business without the aid of the central station.

With the present co-operation a motor salesman necessarily "boosts" central-station service in trying to sell his motor, and the matter is brought to the attention of the prospective customer oftener than were but one man handling the entire deal. To this end it is helpful if the motor salesmen of the town are familiar with the rates of the company selling current, otherwise they are likely to confuse the prospective customer as to the probable cost of service.

The solicitor should be able to furnish to the customer figures not only on the cost of service but also on the cost of motors, wiring, etc.; he should be able to lay out the most satisfactory method of driving the shop, eliminating as nearly as possible all friction losses, at the same time avoiding over-motoring, which in some plants will increase the investment enormously without effecting any practical saving. He should know the type of motor best suited for various types of machinery—should, in short, possess the salient principle of engineering together with a liberal allowance of good salesmanship.

The solicitor's duties have by no means ceased the moment he secures the customer's signature to a contract. One customer who is dissatisfied but uses service because he is bound by contract will do the business more harm than a dozen satisfied patrons can counteract, and the solicitor should be in a position to offer suggestions in regard to changes in operation, form of contract, or in some way to effect a satisfactory settlement of the matter, convincing the consumer that the company is doing all in its power for him instead of "robbing" him, as is the common expression of the public in regard to most public-utility corporations.

Finally, the office should co-operate with the field force in handling customers, practicing courtesy and attention with all inquirers, making the entire sales department a unit in fixing for the electric service corporation its place in the public mind as a benefit to the community.

To this end an inquiry clerk familiar with the company's rates, knowing the company's policies, and having plenty of time to tell the man what he wishes to know, is a valuable adjunct in the fight to make this, over and above all, an electrical age.

RECIPES FOR INCREASING DIVIDENDS

In his paper "Popularizing the Use of Electricity," read before the Michigan Electric Association on August 20, 1908, Errett L. Callahan of Chicago gave some "tested recipes for increasing dividends." They are as follows:

First—Select the best young-lady or young-man salesman in your employment or to be found in town (you may need four or five of them), either to give all or a portion of his or her time to your residence customers, following up inquiries on heating and making a thorough house-to-house canvass of all residences wired and taking time to demonstrate the use of the flatiron thoroughly.

Second—See that an electric iron is included in contractors' bids for wiring of each residence, so that when a meter is set an iron is installed.

Third—Arrange with one of your newspapers to have an iron offered as a premium or at a reduced price with each new subscription. (The Chicago Examiner is doing this and expects to place 25,000 within a year.)

Fourth—Obtain from your nearest college, university or high school a young woman or young man recommended as a hustler to solicit, install and perhaps collect for irons at a commission of 50 cents to $1 per iron.

Fifth—Secure from the manufacturer of the irons an expert solicitor to call and demonstrate the iron at each residence: leaving the iron on trial; then follow up the work by telephone, letter, or by call of your solicitor when necessary.

Sixth—On each Saturday, if the day be warm, take out a load of irons and distribute them on trial. Probably very few will be returned.

Seventh—Rent the iron for 25 cents per month or loan it for a period of one year, customer paying a deposit of practically cost, which is returnable with interest.

Electric cooking has appealed to people who have longed for some means of cooking with absolute cleanliness. It is safe to say that, because of widespread advertising and the progressiveness of the times, you can quite easily persuade many of your customers to the use of electricity to do all their cooking.

The amount of profitable cooking load that you can take on your lines depends upon local conditions entirely.

The size of the city or town has much to do with whether a portion or none of this load comes upon the lighting peak. In summer time and in small cities and towns I do not believe an appreciable amount of the load will come on the peak, for the days are long and dinner is eaten at noon. In large cities perhaps 25 or 30 per cent. of this cooking load would be noticeable on the peak, but even so, it is encouraging to see that these lighting companies are planning to take care of it.

There is a very substantial revenue to be obtained from the use of the various so-called "lamp-socket devices." The coffee percolator and the toaster should be used in the home every morning. The revenue will amount to more than that from the use of a flatiron for the week's ironing. Then there is the shaving cup, water heater and baby-milk warmer, all of which help.

CAMPAIGNING IN LOWELL

J. H. Hunnewell, general superintendent of the Lowell (Mass.) Electric Light Corporation, is conducting an energetic business-getting campaign, using the rental of tungsten lamps and free wiring as important inducements. General Electric tungsten lamps are being rented on a basis of 25 cents per month per lamp, using the 100-watt 80-candlepower and 60-watt 48-candlepower sizes. The rental price includes the lamp, shade and holder and whatever pendant or fixture is necessary. The plan is working successfully, and at present there have been in the neighborhood of 700 lamps installed, while the business is increasing rapidly. The Lowell plant is operated by Stone & Webster.

The Public Service Company of Chickasha, Okla., has been organized with a capital stock of $10,000. The incorporators are Thurman H. Williams and Alphonso C. Cross of Chickasha, and C. Townsend Blake of Trenton, N. J.

ELECTRICITY AND THE FIRELESS COOKER

Some attention was attracted at the recent Grand Rapids convention of the Michigan Electric Association by a paper on "Electricity and the Fireless Cooker," written by John A. Gronberg of Grand Rapids. Following is part of it:

Within the last year the fireless cooker has been developed and perfected, and the only drawback to its universal use has been eliminated. It has been perfected by the elimination of the temporary or makeshift features, such as the use of felt or cloth for insulating purposes, and the substitution of metal, vulcanized wood, asbestos and other materials of a durable and thoroughly sanitary nature in construction. It has been developed by the addition of the one essential, namely, an ability to bake and roast, providing a dry heat, which would if necessary go above 400° F. This feature is provided by what is termed steatite radiators or slabs.

The propensity of steatite to absorb heat quickly and subsequently to give off this heat slowly rendered this mineral just the thing to perfect and complete the fireless cooker. These radiators are heated over any flame or by electric heat and then quickly removed to the insulated fireless cooker, together with whatever article of food it is designed to bake or roast. Two of them, one at the bottom and the other at the top of the fireless "oven," will raise the temperature of the oven to 400 degrees and keep it at that temperature for considerably over an hour, and for four hours will retain a temperature of 325 degrees. This baking and roasting feature, combined with the boiling, steaming and stewing features common to the ordinary fireless cooker, so perfect the fireless cooker, it must be conceded, that it literally "cooks everything for the table."

But is there any economy of fuel in the use of the steatite radiators? Will it not require substantially as many units of heat to put the radiators in condition to secure a baking atmosphere in the fireless cooker as would be required to do the cooking itself?

The answer is a simple matter of arithmetic. It requires from 10 to 20 minutes—depending upon the intensity of the flame—to put the radiators in condition to furnish a baking heat in the cooker for from one to three hours. At the end of that period they can be made as hot as they originally were by being again placed on a flame stove for a few minutes.

Thus far I have referred to the fireless cooker as used in connection with any fuel for cooking. It is possible to use electricity in connection with the fireless cooker with proportionately greater economy in the use of the fuel than in the use of gas, oil or alcohol. In fact, it is now practically demonstrated, and the electric fireless cooker is already ready for the market. The reason why the economy of fuel is proportionately greater through the use of electricity is because it is possible to utilize literally practically every heat unit generated by the current. The coils are introduced in the steatite radiators, holes being drilled therein, and while the radiators are being raised to the required temperature, the fireless "oven" being closed, there is and can be no loss of heat by radiation, while the radiators are heated. Inasmuch as no gas, oil or alcohol flame can be maintained in an insulated chamber or "oven"—lacking the oxygen—there is and must be a loss of heat while heating the radiators of varying but very considerable degree.

When the electric coils have raised the temperature of the steatite radiators to the necessary temperature the current is turned off and the insulated oven continues to maintain the baking temperature through the radiators for one, two or three hours. So, as I have attempted to explain, while the fireless cooker is a very great saver of fuel for cooking through any recognized fuel, it effects a much greater comparative saving in the use of electricity. Indeed, if I may venture the prediction, it will be the combination of the fireless cooker with electricity that will do more than any other single agency to bring the electric kitchen into everyday common use. I think you will concede that if it be possible to cut off three-quarters of the present cost of cooking by electricity its use will be instantly multiplied many times. And that is precisely what the fireless cooker will do.

BILLIARD PLAYING BY ELECTRIC SIGN

How an attractive and attention-compelling advertising effect may be obtained with an electric sign of comparatively small dimensions is shown by an entirely novel installation recently put in place in Chicago on Madison Street near Clark. This sign is double-faced, projecting across the sidewalk, and measures only 11 feet by four feet 10 inches.

On one side is shown a billiard table with two players, as illustrated in the accompanying halftone reproduction. By an automatic flasher controlling the lights which make up the sign one of the players is seen to strike the ball with his cue, apparently making it roll across the table and strike the other two balls, which are correspondingly knocked into new positions after rebounding from the cushion, etc. The operation is then repeated. On the other side of the sign appears a pool table with two players. The game is started by one of the players making the "break," the balls are seen to roll in all directions and two of them fall into the pockets.

When the sign is in operation, hundreds of people stop to watch the performance. The sign is constructed of steel, with porcelain enamel finish in three colors—green, white and black. The lamps outlining the figures, cues and balls are of the candelabra type, either clear, frosted or red, and those outlining the letters are amber colored. All of the lamps are either two candlepower, 12 watts, or four candlepower, 20 watts. The total number of lamps in the sign is 362, of which only 200 are lighted at any one time. The operating expense does not exceed 30 cents per hour, a small consideration in view of the advertising value of the display. The sign was installed by the Haller Sign Works, 319 South Clinton Street, Chicago.

BILLIARD PLAYING BY ELECTRIC SIGN

DEATH OF DR. HABIRSHAW

In the death of Dr. William Martin Habirshaw at Saratoga Springs, N. Y., August 15th, the electrical industries lost one of their leading scientific investigators and manufacturers. From early manhood Dr. Habirshaw had occupied an honorable and distinguished position in the business and scientific world. Born in New York city 74 years ago, he had served the U. S. Navy as an engineer during the Civil War and after returning from a short residence in England he took up his professional work as a chemist in this country, receiving many distinguished assignments in recognition of his ability as an expert analyst. His association with the problems of insulation followed his study of gutta-percha and rubber at the time electrical development was just beginning in this country. The India Rubber and Gutta Percha Insulating Company, which recently became the Habirshaw Wire Company, was a result of his business insight as well as his scientific skill, and during the growth and development of the concern he, as its president, always maintained a close interest in its conduct. At the great works at Yonkers Dr. Habirshaw had himself produced many specialties which are manufactured by his company and used the world over.

Dr. Habirshaw was a man of broad culture and interests and had a host of acquaintances, including almost every New Yorker of note in any field—art, literature, science and business. He was a member of a number of the clubs of his city and belonged to many technical and scientific societies, the Chemical Society of London being one of his highly prized memberships. Not less than his scientific and business achievements do his friends remember his kindly, gentle and courteous nature. For the past five years he had been a sufferer from a disease which he knew to be incurable. During this long period he faced the inevitable with calmness and bravery.

Resolutions in appreciation of his value and ability as an officer, an analytical chemist and a man were adopted by the directors of the Habirshaw Wire Company, and at the time of his funeral, which occurred on August 19th, the works were closed and the services attended by many of the employes.

ELECTRICIANS FOR NAVY YARDS

Examinations will be held about September 8th at the various government navy yards, the Chicago Naval Training Station and at Pittsburg, Pa., and Schenectady, N. Y., for the following positions in the Department of Yards and Docks at the yearly salaries noted:

Navy Yard, Boston, Mass., electrician	$1,400
Navy Yard, Brooklyn, N. Y., electrician	1,400
Navy Yard, Philadelphia, Pa., electrician	1,400
Navy Yard, Washington, D. C., electrician	1,400
Navy Yard, Norfolk, Va., electrician	1,400
Navy Yard, Mare Island, Cal., electrician	1,400
Navy Yard, Puget Sound, Wash., electrician	1,200

The examination will be open to all who can give evidence of experience and who are citizens of the United States.

Applications should be addressed to the commandants of the yards or stations at which the applicant desires to be examined. Applicants desiring to be examined at Schenectady or Pittsburg will address Assistant Civil Engineer Carroll Paul, U. S. N., General Electric Company, Schenectady, N. Y., and H. M. Phillips, Westinghouse Electric and Manufacturing Company, East Pittsburg, Pa., respectively. Applications must be delivered on or before Thursday, September 3, 1908, as no applications will be received after that date. Each applicant should state in his application his name, age, residence, citizenship, present occupation, and previous employment. The applications should be accompanied by evidence of citizenship and by certificates, preferably from previous employers, as to character, habits of industry and sobriety, and skill and experience in work of the kind required. The receipt of each application will be acknowledged and the applicant will be furnished with blanks, a copy of instructions, etc.

The examination will be practical in character, having reference exclusively to the requirements of the position to be filled. The applicant should have an intimate practical knowledge and experience sufficient to enable him to install, operate and make all station repairs to the usual alternating and direct-current apparatus, power-plant and communicating systems. His experience should be sufficiently broad to enable him to make correct estimates for repairs and to carry on all of the work in connection with the entire plant.

POWER DEVELOPMENT IN VERMONT

In the state of Vermont, the Rutland Railway, Light and Power Company owns 3,000 acres of heavily wooded timber land used for water shed and two large storage reservoirs. One of these, the Chittenden reservoir, has an elevation of 1,000 feet above Rutland, and an area of 900 acres, holding upward of 500,000,000 cubic feet of water supplied by four or five mountain streams and numerous never-failing springs. Four miles below this reservoir on East Creek, with a fall of 447 feet, is the East Pittsford reservoir, which has an area of 300 acres, holding approximately 70,000,000 cubic feet of water. Eight thousand feet below this, on the same stream, with a fall of 210 feet, and connected by a steel penstock five feet in diameter, is a modern fireproof generating station, containing 2,250 horsepower in 13,200-volt 25-cycle, alternating-current hydro-electric generating apparatus.

In order to provide relief for the wheels under fluctuating loads, a regulating tower is provided. This consists of a steel tank 15 feet in diameter and 50 feet high, placed on a steel tower 185 feet high and connected to the steel penstock. The power is transmitted by two distinct 13,200-volt transmission lines into the sub-station in the city of Rutland. This sub-station is equipped with 300 kilowatts capacity in railway rotaries and transformers, operating in connection with a 400-ampere-hour storage-battery plant; 600 kilowatts capacity in frequency-changer sets, providing 60-cycle current for street and commercial lighting in the city of Rutland and neighboring towns, and 400 kilowatts capacity in transformers, providing 25-cycle current for large power consumers. Leading from the Rutland sub-station is a high-tension transmission line connecting two additional sub-stations at West Rutland and Castleton Corners for furnishing light and power to neighboring towns and the street railway. The latter lines aggregate $24\frac{1}{2}$ miles of track in the city of Rutland and an interurban line 16 miles in length.

MICHIGAN ELECTRIC ASSOCIATION

(Continued from page 151)

now the best protection of single buildings against lightning. The name has been abused by "lightning-rod agents," but if a sufficient number of lightning rods, properly connected, are placed about a building sure protection is afforded.

Blackboard diagrams were given to assist the audience to understand the nature of lightning and how it is produced. Few technical terms were used by the speaker, and his explanation was very clear and forcible. Lightning is usually an equalization of potential difference between moisture particle and moisture particle in the clouds. A discharge from cloud to ground is comparatively speaking, unusual. Some interesting estimates were given to show the power of a lightning stroke. Thus it is supposed that a lightning discharge of 1,000 feet represents a potential difference of 50,000,000 volts. There is enormous power in the lightning stroke, but little energy, because its duration is so short. Perhaps the frequency is 500,000 cycles per second.

Dr. Steinmetz spoke highly of the work of Professor Creighton in Colorado in investigating lightning phenomena and said that we have learned more about lightning in the last five years than in all the previous history of the world. Lightning protection is now being studied in a scientific manner, and protectors for electric circuits will be designed which will work just as surely as a motor will revolve when current is applied to it.

Heating and Domestic Uses of Electricity

Following his custom, President Hillman had something to say about increasing the membership of the association at the opening of Thursday morning's session. He remarked that the association has now about 125 members, a gain of over 100 per cent. during the year. Messrs. Chandler of Sault Ste. Marie, W. P. Stephens of Kalamazoo and Phillips of Detroit all spoke earnestly on the benefits of the association.

E. L. Callahan of the Chicago office of the General Electric Company read a paper on "Popularizing the Use of Electricity." He said that in small cities approximately 95 per cent. of the residences are not wired, while in large cities about 98 per cent. are not wired. He spoke of the importance of house-to-house solicitation and of show rooms, but called particular attention to electric heating appliances, concluding with seven "tested recipes for increasing dividends." In relation to the cost of electric cooking, he gave a table of current consumption in his own house covering a period of 21 months, which figured out the average watt-hours per meal per person to be 261.29.

William Chandler gave the results of electric heating in Sault Ste. Marie in a paper prepared by himself and D. B. South. While in many respects electric heating has not proved a phenomenal success, Mr. Chandler thinks that central-station men must not condemn it by any means, as it has already performed much in advertising the entire electrical business and also in educating the public to the manifold uses of electricity. "The field is a wide one, and with the experience we are gaining and the improved apparatus we must receive in the future, the time is not far distant when large returns will be shown from this class of business." Mr. Chandler's paper excited great interest, for it was a record of practical experiences from the central-station point of view. An effort will be made to give a more complete idea of its contents in a future issue of the Western Electrician.

Edwin A. Johnson of the General Electric Company of Schenectady detailed a satisfactory experience with electric cooking in his own home. For a family of three adults practically all the cooking (except water heating, which is done by gas) is accomplished by electricity. At a rate of five cents a kilowatt-hour the highest monthly bill for several years has been $4.45. Mr. Johnson has arranged a six-quart electric heater with a nest of steamers within it. Thus a chicken may be cooked in the lower receptacle, beans above, potatoes above this and perhaps the peas or corn in the topmost steamer, all at the same time, without any additional charge for current, and from one plug.

William Constable of Grand Rapids read the paper of John A. Gronberg of the same city on "Electricity and the Fireless Cooker." An extract from this paper is given elsewhere in this issue.

Walter Bennett of the Detroit Edison Company gave some of the experiences of his company with electric cooking in a carefully prepared paper. About 5,000 electric flatirons are in use in Detroit, and the motor-driven washing machines come next in popularity, 450 being connected to the lines. In relation to electric cooking, Mr. Bennett pointed out that where evening dinners are the custom the cooking peak will coincide to a large extent with the lighting peak. The results of tests show an average expenditure of 1.09 kilowatt-hours per person per meal. With gas at 80 cents a thousand and electricity at 3.8 cents a kilowatt-hour, electricity is shown to be very much more expensive for cooking than gas. Indeed, current should be sold at from 0.4 to 0.6 cent a kilowatt-hour to be as cheap for cooking as gas at 80 cents a thousand. The writer concludes that it is a far cry to the use of electric cooking in families now using electric light, but many other domestic electric appliances are very useful.

In the discussion Mr. Hillman excited interest by the remark that two weeks ago the peak of the Grand Rapids-Muskegon Power Company was at 10 a. m.

The report of the electric heating committee was read by William Constable, chairman. The report was accepted with thanks and the committee continued. It is as follows:

"Reports from over 30 of our member stations of the association tell us that in spite of the prevailing conditions of hard times during the last nine months the call for heating devices has still kept up in a most gratifying manner.

"Most of the stations have tried to keep up interest in this field by their display rooms, window displays, demonstrations, advertising, and free-trial offers covering a week to a month on many of the most popular devices. While most of the devices have not had any phenomenal sale, the flatiron has held its own with most of our stations for the percentage of new-residence business which has been taken on. Your committee reports over 4,000 irons sold in the state since last October.

"A careful estimate of the number of electric irons in use in the state is placed at 20,000, representing a heating income, without increase in investment of plants or transformers, of about $100,000 per annum, with still 60 per cent. of the residence customers to work on, which, with hard work and co-operation of the manufacturers in giving us a still more perfect iron, should raise the annual income to $150,000 this coming year.

"The trouble of burnouts and other mechanical defects of several years ago have been almost entirely eliminated. The most serious of our present troubles is with cord and plug attachments. The manufacturers have spent considerable time and energy in trying to remedy these troubles and have made excellent headway.

"As to the best methods of pushing the sale of irons, your committee finds a uniform policy among most of the Michigan companies, namely, a house-to-house canvass, accompanied by frequent demonstrations in show windows, fairs, etc., along with generous advertising both by printed circular and in the newspapers. Also a free-trial offer of from one week to 30 days' use of this iron, which, perhaps, has brought more gratifying results than any other method. Some of the smaller stations report only 10 per cent. of the irons put out in this way returned, while with the larger companies we find it to run as high as 40 per cent. This is undoubtedly due to the extensive home-laundry business. Another way the writer has found very successful is to send, unsolicited, an iron with every new-residence meter, as part of the installation. In this way you are sure that every new-residence customer has a chance to try the electric iron.

"Next to the flatiron in popularity and as income earners are the toaster, water heaters and luminous radiators. Most stations report the toaster and luminous radiator are equal in popularity, some of the stations having as high as 150 of each on their lines, while others report no call whatever.

"The sale of chafing dishes, percolators, heating pads and other devices seems to be limited, either by reason of their first cost or else infrequency of use. They are, undoubtedly, a fine advertising medium, but at present are not worthy of the same consideration and development that is due the flatiron.

"There is another field which seems for some reason or other to have been left unpushed or undeveloped, and that is commercial heating, namely, glue pots, solder pots, soldering irons, branding irons, etc. Perhaps one of the greatest drawbacks to the introduction of these devices is the high initial cost and frequent burnouts which are reported, particularly on soldering irons.

"Very few of the stations report any great advances in the introduction of cooking outfits. The initial cost of the outfits and devices seems to be one of the greatest drawbacks. Even with such a rate inducement as 2½ cents per kilowatt-hour, as established at the Soo, they do not report any great amount of business from this line.

"Another one of the drawbacks to the present electric cooking outfits is its limited reserve capacity for the average family, also the inability of any yet known devices for heating enough water for the average household at anywhere near a reasonable price.

"Your committee thinks that before the electric cooking outfit is a success we must be able to furnish the public devices that are not only foolproof, but more efficient, longer lived and at lower initial cost.

"As you are well aware, there are a number of cooking outfits in the homes of many of the station managers and favored customers. Your committee feels that you will all be interested in what Mr. John A. Gronberg says in his paper ('Electricity and the Fireless Cooker'). Tests have shown considerable saving by the use of the fireless cooker in connection with the electric outfits. Many of the stations are already recommending its use. The committee feels assured that anything that will further reduce the cost of operation will be gratefully received by the delegates."

R. W. Hemphill, Jr., a member of the electric-heating committee, said in the discussion that the electric flatiron did much to popularize the electric service. Manufacturers and central-station men should get together on the important question of initial cost, which is high and a drawback. Another point is that rates for heating current must not be so low that they will interfere with or adversely affect light and power rates. Mr. Hemphill also spoke of the vacuum cleaner as an excellent thing for electric-light companies to use. His company rents out one outfit at $2.50 a day, the current for it being metered in addition. Mr. Hemphill also spoke of one village where every house wired has an electric flatiron.

Mr. Callahan dwelt on the advantages of the coffee percolator, and also pointed out that the unfavorable tests in Detroit were made with equipment now considered out of date. Mr. Chandler remarked that one good feature of the flatiron is that one unit can be substituted for another in the iron when burned out. This idea ought to be carried out in electric cooking devices. Mr. Callahan answered this by saying that utensils of the character desired are about to be brought out.

A short paper on "Electric Display Windows for Effectively Advertising Electricity" was read by Charles O. Blackford of Grand Rapids. The author said that the power company in Grand Rapids has made a series of electric-motor and electric-driven machinery window displays. These have been of great interest to everyone, especially to power users. The benefit received from such displays can scarcely be overestimated, because nearly everybody can use electric power in some way. Mr. Blackford also gave some useful hints on the use of electric light in window displays.

After remarks by J. R. Cravath of the Electrical World, W. E. Keily of the Western Electrician and others, the financial report, showing an excellent condition of affairs, was presented.

Mr. Hemphill, from the nominating committee, then reported a list of officers which was elected as follows:

President—H. W. Hillman, Grand Rapids.

Vice-president—F. B. Spencer, Sheboygan.

Secretary and treasurer—A. C. Marshall, Port Huron.

Executive committee (new members)—O. S. Wood, Ionia; William London, Traverse City.

Finance committee—Alex Dow, Detroit; J. F. Collins, Saginaw; H. A. Mott, Jackson.

This was the last business before the convention, which then adjourned.

Entertainment Features.

A conspicuous feature of the Grand Rapids convention was the number and excellence of the entertainment features. The thanks of all who attended the convention are due to the entertainment committee, and particularly to its efficient chairman, for the character of these entertainments and the manner in which they were carried out. The committee consisted of A. L. Searles, Fort Wayne Electric Works, Grand Rapids, chairman; H. W. Hillman, Grand Rapids-Muskegon Power Company; H. A. Mott, Commonwealth Electric Company, Jackson; W. J. Trott of the Fostoria Incandescent Lamp Company; L. M. Page of the General Electric Company; M. J. Burlingame of Fairbanks, Morse & Co.; John D. Noyes of the Westinghouse Electric and Manufacturing Company, and F. E. Koehler of the Grand Rapids-Muskegon Power Company, all of Grand Rapids.

On Tuesday afternoon, August 18th, there was an automobile ride for the ladies, who were taken through the parks. Later in the same afternoon the men were taken in special cars to the factory of the Grand Rapids Hand Screw Company. The interesting electric plant at this factory was described in a paper read at the convention.

In the evening both ladies and gentlemen were taken in special cars to Ramona Park, where an excellent vaudeville performance and various other forms of entertainment were supplied, all without cost to the visitors. A special balloon ascension was arranged at the close of the theatrical performance. A man dropped in a parachute from the balloon, and the whole exhibition was made plainly visible by a searchlight, directed first on the balloon and then on the parachute. It should be stated that by the courtesy of Mr. Benjamin Sanchett, general manager of the Grand Rapids Railway Company, special cars were donated for both Tuesday afternoon and evening by the railway company. This kindness was much appreciated.

Wednesday afternoon's entertainment included a performance for the ladies at the Airdome. The men were taken on a carriage drive, first to the main sub-station of the Grand Rapids-Muskegon Power Company, where 110,000 and 72,000-volt current from incoming lines is transformed to 19,000 and 6,600 volts for interurban and local use, respectively. The Westinghouse transformers used are truly of an enormous size, and, as was to be expected, the delegates were greatly interested in this instructive installation. After leaving the sub-station the party was driven to the Eagle Mills of the Grand Rapids Plaster Company, which are entirely operated by induction motors. The gypsum is hauled from the mine by a windlass and delivered to crushers, afterward being ground in mills. The resulting product, as fine as flour, is then treated to drive off moisture, the result being the finished plaster. The drive back to the hotel was made through John Ball Park, which is a beautiful pleasure ground, largely left in its natural state.

After the convention adjourned, on Thursday afternoon, nearly the entire party of ladies and gentlemen—156 by actual count—was taken in special interurban cars to Spring Lake. A stop was made at Fruitport, where the interurban power house was inspected. Current was formerly produced here by generators driven by steam engines. But now the steam plant has been shut down and alternating current obtained from the Grand Rapids-Muskegon Power Company is used to operate rotary converters, from which direct current is supplied to the line. Fruitport is at the head of Spring Lake, and while waiting for steamers to take them to the Spring Lake hotel, where dinner was served, the members of the party indulged in dancing in the pavilion and other amusements. After the dinner at the hotel, which was complimentary, like all the other entertainment features, some of the visitors departed for Chicago, but the greater part returned to Grand Rapids on the interurban car, very well pleased with their outing.

CONVENTION NOTES

The Pittsburg Transformer Company, represented by C. R. Lininger, distributed a handsome calendar.

There were about forty ladies in attendance, and they were carefully looked after by the entertainment committee.

Tasteful badges of white silk, lettered in gold and supporting the arms of the state of Michigan, were supplied to all delegates.

The Illinois Electric Company, Chicago, was represented by C. J. Litscher, who continuously wore "the smile that won't come off."

Dr. Steinmetz arrived on Tuesday and left Wednesday evening. He was the guest of H. W. Hillman, president of the association.

Various types of domestic electrical apparatus were displayed by the Central Electric Company of Chicago, represented by Richard L. Kimble.

Detroit sent a good central-station delegation, including Alex Dow, E. F. Phillips, W. B. Thompson, A. P. Biggs, Walter S. Bennett and others.

Miss Sarah M. Sheridan, the efficient sales manager of the Detroit Edison Company, attended the business sessions regularly, for she attended the convention on business.

The Lewis Electric Company of Grand Rapids, which is one of the largest electrical contractors in that city, was ably represented by Guy Lewis (who read a paper before the convention), A. O. Derby and others.

The Electric Appliance Company of Chicago, represented by E. R. Field and F. J. Alderson, displayed a line of domestic apparatus in the shape of flatirons, water heaters, chafing dishes, warming pads, etc.

The Western Electric Company distributed attractive literature. It was represented by E. H. Van Gorder of Grand Rapids and George H. Lounsbery and W. G. Sims of Chicago, who were all "on the job."

The H. W. Johns-Manville Company was represented by Fred C. Frumveller of Detroit, who displayed a Victor combination volt and ammeter. Linolite showcase lamps, which may be made to order for any lengths up to 15 feet, were also shown.

W. J. Trott of Grand Rapids, Michigan representative of the Fostoria Incandescent Lamp Company, is temporarily on crutches, owing to a painful accident to his ankle, but he was nevertheless in constant attendance and alert to represent his company. The convention hall was lighted by Fostoria tungstens.

The Nernst Lamp Company of Pittsburg showed a full line of the new Westinghouse-Nernst units, multiple and single glower, for alternating and direct current. The many new features of these lamps, especially the screw burners and the wafer heaters, made the exhibit one of unusual interest. The exhibit was beautifully illuminated by Westinghouse-Nernst 110-watt units. The company was represented at the convention by H. M. Browne, manager of the Detroit office, and J. O. Little, manager of the publicity department.

Among the lamp men present were J. S. Corby, Bryan-Marsh Company, Chicago; William Love, Shelby Lamp Company, Shelby, Ohio; James Z. Coale, Columbia Incandescent Lamp Company, St. Louis; William R. Collins, New York and Ohio Company, Warren, Ohio, and C. R. Wood, Moline Lamp Company, Moline, Ill.

Of course, the Grand Rapids-Muskegon Power Company looked after the convention in every possible way, and its men were in constant attendance. Among the Grand Rapids central-station men present were A. F. Walker, Fred T. Masterson, William Constable, F. E. Koehler, Charles O. Blackford, John D. Fry, J. D. Vandervliet, A. C. Harris, W. Gilbert and others.

A strong delegation represented the Fort Wayne Electric Works. It included A. L. Searles, Fred Reynolds and H. L. Eicher of Grand Rapids and A. L. Pond of Chicago. Mr. Searles won golden opinions as the chairman of the entertainment committee, and Mr. Pond, a charter member of the association, made an earnest and effective plea at Wednesday's session for admitting associate members. Fort Wayne electric fans had much to do with keeping the delegates comfortable.

President H. W. Hillman and Secretary A. C. Marshall were re-elected. Mr. Hillman is manager of the Grand Rapids-Muskegon Power Company and Mr. Marshall is general manager of the Port Huron Light and Power Company. Mr. Hillman, formerly connected with the General Electric Company, has a wide acquaintance among electrical men. He is an enthusiastic believer in all things electrical, and his Schenectady "house without a chimney" and his electrical novel, "Looking Forward," have made him well known.

General Electric interests were well cared for by Jesse Scribner, E. L. Callahan and Fred T. Benson of Chicago, Edwin A. Johnson of Schenectady and L. M. Page of Grand Rapids. Dr. Steinmetz, who attended in his individual capacity, is of course the consulting engineer of the General Electric Company, and Prof. E. E. F. Creighton was another distinguished Schenectady visitor. Mr. Callahan had a paper before the convention, and Messrs. Benson and Johnson took part in the discussion. Electric flatirons, heating pads, etc., were exhibited, and literature was distributed.

The Westinghouse Electric and Manufacturing Company was represented by J. D. Noyes, Grand Rapids manager, and F. M. McAdams, L. Whiting and W. B. Wreaks of the Detroit office, who presided at a tastefully arranged booth occupying the end of the main corridor next to the convention headquarters. The entertainment of the delegates included a visit to the 110,000-volt transmission line of the Grand Rapids-Muskegon Power Company, which transmits power generated by Westinghouse apparatus at Croton Dams to Grand Rapids, where it is transformed down to 6,600 volts by very large Westinghouse transformers.

William Chandler of Sault Ste. Marie, R. W. Hemphill, Jr., of Ann Arbor, H. A. Mott of Jackson, George D. Westover of Cadillac, L. W. Green of Howard City, H. A. Chase of Hart, C. M. Wardwell of Ypsilanti, R. H. Ellis of Blissfield, H. E. Allen of Oxford, Ralph Loveland of Lowell, John Nelson of Greenville, B. Barton of Sturgis, O. S. Wood of Ionia, F. B. Spencer of Sheboygan, D. E. Connine of Dowagiac, James Trimble of Manistee, W. B. Stephen of Kalamazoo, H. A. Wing of Adrian, John A. Cavanaugh of Benton Harbor, R. T. Barry of Belding and C. A. Worthington of Schoolcraft were some of the well-known electric-light men of Michigan who were present.

The following-named representatives of manufacturers or dealers were among those present: American Steel and Wire Company (electrical department), B. H. Ryder, Chicago; American Circular Loom Company, M. F. King, Chelsea, Mass.; Julius Andrae & Sons Company, T. H. Desmond, Milwaukee; M. B. Austin Company, R. J. Thorne, Chicago; F. Bissell Company, M. F. Walker and B. I. Gray, Toledo; Fairbanks, Morse & Co., M. V. Burlingame, Grand Rapids; Grand Rapids Electric Company, D. D. Cody, Grand Rapids; Harvey Hubbell, R. L. Wildauer, Chicago; Holophane Company, A. C. C. Kelcher, New York; Monarch Electric and Wire Company, G. Morgan Hall, Grand Rapids; W. G. Nagel Electric Company, W. G. Nagel, Toledo, and Phil Case, Grand Rapids; M. B. Wheeler Electric Company, M. B. Wheeler, Grand Rapids.

A charter has been granted to the Interurban Electric Company, Limited, with share capital of $400,000, and with head office at Toronto, Canada. It is to operate in the municipalities about Toronto and will acquire the plant, rights and other assets of the Stark T. L. & P. System, Limited.

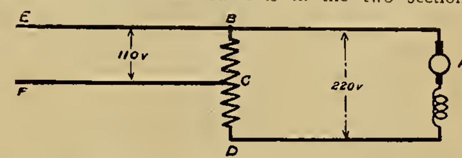
QUESTIONS AND ANSWERS

CURRENT RELATIONS IN AUTO-TRANSFORMER

D. J. S., Marion, Ohio: A transformer is connected as shown in the accompanying diagram. The source of supply is 110 volts and a 220-volt motor is connected to the outside taps of the transformer. What would be the current in *BC* and in *CD*? Would the former be appreciable?

ANSWER

This is a 1-to-2 auto-transformer of which the coil section *BC* energizes the coil section *CD*, both sections having the same number of turns. Under these conditions the currents in the two sections



CURRENT RELATIONS IN AUTO-TRANSFORMER

will be almost exactly equal, the current in *BC* being slightly greater because of the magnetizing component of the current through it. Thus the current in the main lines *EB* and *FC* would be a trifle above twice as great as that through either of the branch circuits *BC* and *BADC*.

ROTARIES OR MOTOR-GENERATORS

E. B., Marytown, W. Va.: We have an alternating-current transmission line one mile long carrying three-phase currents at 2,000 volts. We wish to change this current to 250 volts direct current. Would a rotary converter or a motor-generator set be best?

ANSWER

Not knowing the frequency of the supply circuit, the amount of direct current required and other conditions, it is impossible to say definitely which machines would be better. With intelligent care, with a frequency not over 60 cycles and a machine not smaller than two kilowatts, a rotary converter, with the necessary step-down transformer, would probably be better and more efficient. However, with only ordinary attention, with high frequency or with very small machines an induction motor-generator would be less troublesome, even though less efficient. It would also have a lower power factor, but could be more conveniently operated. A synchronous motor-generator set would require about as much attention as a rotary. If a wide range of direct-current voltage regulation is required, a motor-generator is better, although a moderate range of adjustment is possible by using a potential regulator with a rotary converter.

CHANGING AN ALTERNATOR'S FREQUENCY

T. W., North Milwaukee, Wis.: What changes are necessary to make an 1,100-volt, 125-cycle alternator generate 60 cycles? Will the voltage remain the same?

ANSWER

The speed of the machine must be reduced in proportion to the change in frequency, i. e., to a little less than half the original. The armature connections should be changed from a parallel to a series connection, i. e., from having the coils connected in two parallel groups to having them all connected in series. If the latter is impossible, the machine will not generate the proper voltage unless the field current is more than doubled, which would probably burn out the field coils, or unless the armature is entirely rewound with a little over twice as many turns per coil using wire of half the cross-sectional area of the present winding. In either case the capacity of the machine would be only one-half the original.

NEW RAILWAY IN THE ALPS

By the opening of the 22 miles of electric railway in the Alps Mountains between Argentiere and Chatelard the journey from Italy to Paris is considerably shortened and a region comparatively little known to the Continental traveler is thrown open. One may now view some of the finest scenery in the Alps from the comfort of up-to-date electric cars as the train makes its way along the mountain side.

NEW TYPE OF SWITCHBOARD FOR SALT RIVER PROJECT

The Salt River Project of the United States Reclamation Service is well known to the readers of the Western Electrician, since from time to time accounts have been published in these columns concerning the great irrigation and power works the government engineers are carrying out near Roosevelt, in Arizona. A very complete general description of the Salt River irrigation and hydro-electric power project, illustrated with recent photographs of the construction work, was given in the issue of August 15th. To recall briefly some of the details given in that article: The dam, 284 feet high, will impound the largest artificial reservoir in the world, and when the reservoir fills the present site of the large town of Roosevelt will be covered with 220 feet of water. About 200,000 acres of arid land, near Phœnix, is to be irrigated by a canal system fed from the main reservoir, and it is intended to irrigate an additional 40,000 acres by underground waters, made available by the installation of pumping stations at suitable points. Two important features of the Salt River project are a 6,000-kilowatt hydro-electric power station and a 45,000-volt transmission system.

The primary object of the generating station referred to above is to provide power for the operation of these pumping plants, and it is expected that several other generating stations will be constructed at various points to provide still more power. However, a market for surplus power can easily be found in the towns in the Salt River Valley. A temporary plant has been in operation for some years at the Roosevelt dam to supply power for the operation of the cement mill, construction machinery, lighting of the town, etc., and some of the machines in this station are to be transferred to the new power plant. The purpose of this article is to describe the controlling board which has recently been completed for installation in the new power station.

The alternating-current switchboard selected by the government engineers for controlling the apparatus in the main station is an excellent illustration of recent "bench" control-board construction. It is of the "open" type, so that the switchboard operator can have an unobstructed view of the generator room between the instrument section and the control bench. This bench-board is equipped for the control of the following circuits, the exciter switchboard being entirely independent and of the ordinary vertical construction.

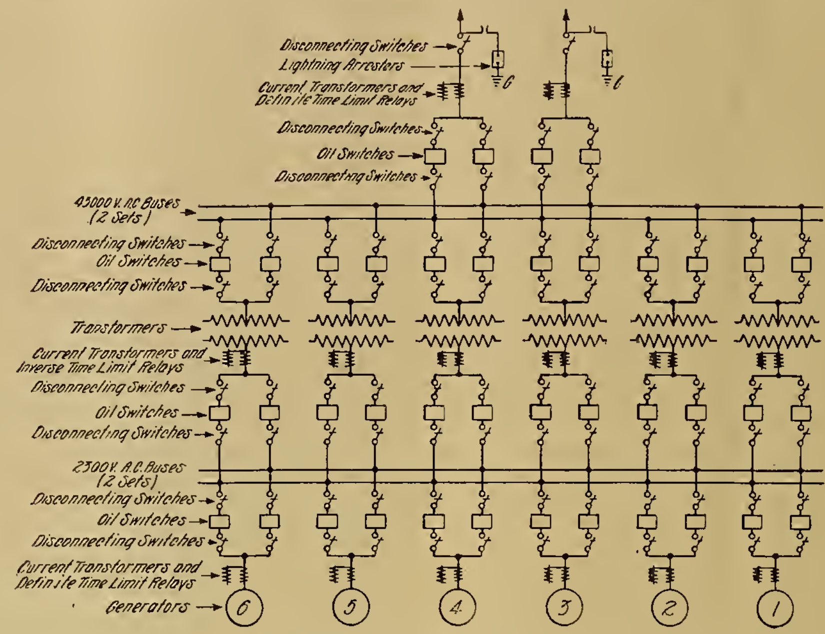
Six 2,300-volt, 1,060-kilovolt-ampere, 25-cycle, three-phase generators.

Six 2,300-volt delta, 45,000-volt Y, 1,060 kilovolt-ampere, 25-cycle, three-phase banks of transformers, with grounded neutral.

Two 45,000-volt, 6,000-kilowatt, three-phase outgoing lines.

The accompanying circuit diagram shows the system of connections specified by the government, one line in this diagram representing the three phases. It will be seen that both high and low-tension buses are in duplicate, allowing ample flexibility for operation, testing, inspection and repairs. Two electrically operated oil switches are used in every circuit, and complete control of the system is therefore obtained at the bench-board. This arrangement is advantageous where it is important that there be no shutdowns of an appreciable length of time. All protective relays used on this board are of the time-limit type, in order to prevent shutdowns due to momentary overloads. The generator relays are also set with a definite overload time-limit. Inverse time-limit overload relays are used on the tarnsformer circuits and are so connected that trouble in any transformer will automatically disconnect all the transformers. By using series relays on the high-tension side of the transformers, in addition to the low-tension relays, only the defective bank of transformers would be disconnected in case of trouble.

The low-tension oil switches are the General Electric Company's standard type F, form K-4, each complete switch consisting of three single-pole, single-throw elements, operated by a single solenoid. These switches are in separate fireproof cells. The disconnecting switches, bus-bars and instrument transformers are mounted on pipe framework above the oil-switch cells. One of the high-tension oil switches, photographed separately, is shown herewith. These type F, form K-6 switches are operated in groups of three single-pole elements by solenoids mounted on top of the switch cells. In this case the buses and disconnecting switches are located below the oil-switch cells. Protection against lightning is obtained by the use of a three-phase aluminum-cell lightning arrester for each transmission line, these arresters being mounted outside of the station.



CIRCUIT DIAGRAM OF SWITCHBOARD CONNECTIONS FOR SALT RIVER PROJECT POWER HOUSE, ROOSEVELT, ARIZ.

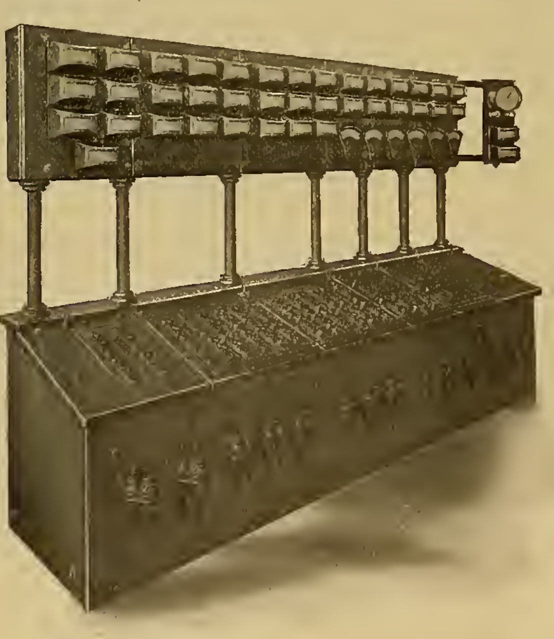
The bench-board proper consists of six panels of black slate, the total height, including the instrument section, being eight feet two inches, and the length, exclusive of the swinging bracket, 12 feet 7 inches. Facing the switchboard, the first panel at the left controls the two outgoing lines, the next two panels each control three banks of step-up transformers and the three panels at the right-hand end control two generators each. The alternating-current voltmeters and the synchronism indicator are mounted on a swinging bracket at the right-hand end of the board.

One alternating-current ammeter, one field ammeter and one polyphase indicating wattmeter are provided for each generator circuit.

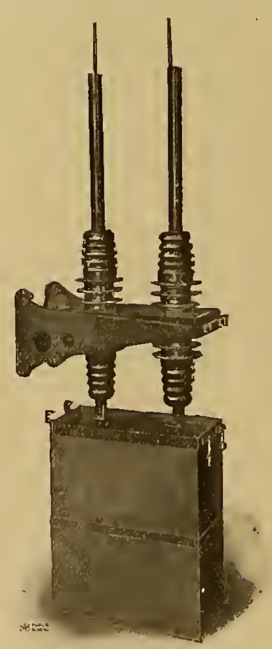
The synchronizing and control switches and the relays are mounted on the control bench. Two synchronizing receptacles are provided for each generator, one being used when synchronizing with each bus. Two sets of contacts in these switches are used for synchronizing purposes, but the third set of contacts is connected in series with the closing side of the corresponding oil-switch control switch, so that no damage can be caused by the operator becoming excited when synchronizing and trying to close the wrong oil switch. To assist the operator in synchronizing, a governor control switch is provided for each generator circuit, this being a double-pole, double-throw, reversing switch connected to the governor motor.

The controlling switches for the oil switches and field switches are of the well-known twin pull-button type. One button actuates the "closing" contacts and the other the "opening" contacts, and they are so interlocked that it is impossible to operate both buttons together. An indicator is provided on each switch, which shows green after the control switch has been operated to open the oil switch and red after it has been operated to close it. The indicating lamps are connected so that they show the actual position of the main switch, red when the oil switch is closed and green when it is open. If the indicating lamps and the switch indicator do not agree the operator knows that the oil switch has tripped automatically.

Generator-field rheostats are mounted below the switchboard gallery, and are controlled by combination bevel-gear and chain mechanisms, the operating hand wheels being mounted on pedestals in front of the switchboard. The field switches



Open-type Instrument and Bench-control Switchboard



100-Ampere, 45,000-volt Oil Switch

SWITCHING APPARATUS FOR SALT RIVER PROJECT POWER HOUSE, ROOSEVELT, ARIZ.

are solenoid-operated and controlled from the bench-board, the same type of control switch and indicating lamps being used as for the oil switches.

Mimic bus-bars mounted on the control switch-bench consist of small polished copper bars which have no electrical connection, but serve to show the system of alternating-current connections. In this working-circuit diagram the controlling switches represent the oil switches, and nameplates represent the generators, transformers and lines. The overload relays provided for the generator circuits are single-pole, the secondaries of the current transformers being cross-connected. On the middle generator panel is mounted the signal relay which is used to ring an alarm bell when any of the oil switches is tripped automatically. Each transformer circuit and each line is equipped with three ammeters. In addition to these instruments there is one ammeter connected in the neutral bus to read ground currents.

In conclusion, attention may be directed to the general arrangement and equipment of the board. No panel is at all crowded, the control and measuring apparatus is simple, and no superfluous or infrequently used devices are included. The equipment for each circuit is segregated, so that there is no confusion in emergencies. Many recent switchboards have been unnecessarily complicated and crowded on account of includng elaborate testing equipments or other devices used only at long intervals of time, the designers apparently overlooking the fact that switchboards are primarily intended for constant use in controlling the machines and circuits. Simplicity in operation involves a corresponding simplicity in design and equipment, and insures reliability, which, in the large majority of central stations, is of the greatest importance.

The switchboard described above was designed and built by the General Electric Company of Schenectady, N. Y., to meet the requirements set forth in the government specifications, and has just been shipped to Arizona. The photograph of the assembled switchboard was taken at the factory and shows the board as it will be installed.

ILLUMINATION OF A RAILROAD STATION

The Union station at Schenectady, N. Y., besides being one of the most beautiful on any of the New York Central lines, has been pronounced by experts to be one of the best lighted depots in the country, and the same opinion is voiced by all who have seen the station illumination. When the lighting installation was under consideration careful attention was paid to the lighting units from an esthetic viewpoint, as well as in other respects, and as a result they harmonize well with the gray marble finish of the station interior.

The main waiting room is lighted by General Electric high-current arc lamps equipped with concentric diffusers and opal shades, there being three fixtures suspended from the ceiling and three eight-ampere arc lamps in each fixture. Each lamp is operated in multiple from the alternating-current, 60-cycle supply circuit. As auxiliaries to the main lighting units, incandescent lights with frosted globes are supported in neat-appearing fixtures on the side walls.

Although the arc lamp shown in Fig. 1 is not of the type used in this installation, the illustration will serve to show the relative positions of the diffuser and shade. The lower shade of light opal glass serves to direct the greater portion of the light against the under side of the porcelain-covered metal reflector which, it will be noticed, is slightly cone-shaped and corrugated. The corrugations serve to diffuse the light, the rays being directed outward and downward at every conceivable angle. The resulting illumination is soft and restful, and the light, penetrating to all parts of the room, eliminates harsh and unnatural shadows.

Fig. 1. Arc Lamp with Concentric Diffuser

Fig. 2. Night Illumination with Arc-light Diffusers

ILLUMINATION OF A RAILROAD STATION

Comparing this method of lighting with direct lighting, that is, with arc lamps without diffusers, engineers and architects who have noted the difference seem to agree that the former is by far the better. Although the intensity of the illumination with this method is relatively quite low, it is easier to read or to see any object in the room, and the general effect is more restful than with direct illumination.

The accompanying illustration (Fig. 2), showing the lighting of the station at night, while giving a general idea of the installation, fails to show the true beauty and effectiveness of the illumination. The following tabulation of data is of interest and may serve as a basis of comparison with other installations:

Length of room	103 feet
Width	44 feet
Area	4,532 square feet
Number of arc lamps	9
Watts per lamp	620
Total kilowatts	5.58
Watts per square foot	1.22
Height of lamps from floor	23½ feet

KIMBLE VARIABLE-SPEED MOTORS

The Kimble variable-speed motor for use on single-phase circuits is an alternating-current device which possesses all the familiar advantages of a direct-current machine besides including a number of operating points over the older form of motor.

The speed-control mechanism is enclosed within the casing of the motor itself, and there is no starting or control apparatus external to the machine. The variation of speed is effected by shifting the brushes, and the possible range includes all speeds from 300 to 3,000 revolutions per minute with as fine gradations as desired. The current consumption follows the load closely. Included with the brush-shifting mechanism is a switch device which enables the power to be cut entirely off at the extreme position of the control lever.

When the lever is moved from its "dead" position the motor is at once given its "full-speed" brush-setting, so that it starts up with its maximum torque. The speed may then be varied to any desired rate by moving the lever further on to the slower speed positions. The first experiments with the machine had the "off" position at the slow-speed end of the range, but this has been reversed in the commercial models in order to obtain the initial larger starting torque.

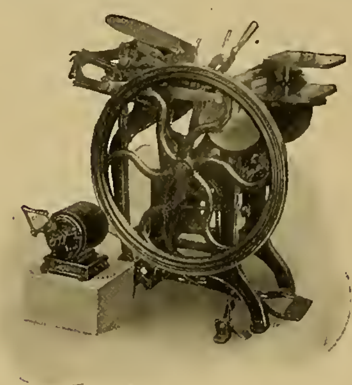


FIG. 3. VARIABLE-SPEED MOTOR FOR PRINTING PRESS

Full line voltage may be impressed upon the motor while standing still or locked, without danger to the windings. The starting current is no larger than the running current—a feature in which this series motor has a decided advantage over the induction motor. The installation is ideally simple—two wires run to the motor—and there are no starting box, resistance coils, compensators or clutches.

The Kimble variable-speed motor is at present made in two models with sizes of ⅛, ¼ and ⅓ horsepower, and ½, ¾ and 1 horsepower. The smaller sizes are made in the type shown in Fig. 1. With these motors any speed from 300 to 3,000 revolutions per minute may be secured. The larger motors, illustrated in Fig. 2, are arranged with a reversing switching device in addition to the speed-variation feature, so that they may be run at the desired speed in either direction, the

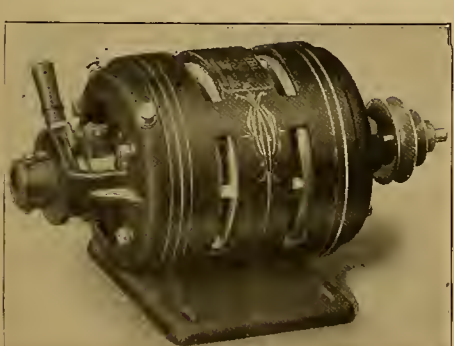


FIG. 1. KIMBLE VARIABLE-SPEED MOTOR, SMALL SIZE

FIG. 2. KIMBLE VARIABLE-SPEED MOTOR, LARGE SIZE

FIG. 4. VARIABLE-SPEED VENTILATING FAN

entire control being with one lever. The possible range varies from zero to 2,800 revolutions per minute.

A special use to which this type of variable-speed motor is adapted is the driving of such machinery as job-printing presses, which require to be frequently stopped and must be under close speed control. For this use the small motor, shown in Fig. 3, is mounted on a spring base which maintains a constant pressure on the friction drive engaging the flywheel. The control rigging is connected through an arrangement of rods and levers to a pedal so that the operator has full control over the machine from his position for feeding the press. The variable-speed motor is useful for driving forge-blowers, delivering any desired strength of draft, and for exhaust fans. The motors are enclosed in dust-proof cases and the combined apparatus of motor and blower or motor and fan is built rigidly together (Fig. 4) and furnished as a unit by the manufacturer.

On account of the manifest impossibility of burning out this single-phase, alternating-current series motor by overloading or improper starting, it seems indeed genuinely "foolproof." The simplicity of installation—no external apparatus—and the ease of control by a single lever, are features that will commend this machine to the customer who is looking for a small satisfactory motor under close control. A two-years guarantee is offered on each of its variable-speed motors by the Kimble Electric Company, whose office and factory is at 617 West Adams Street, Chicago.

A 2,000-MILE ELECTRIC AUTO RUN

Carl J. Metzger, Chicago sales manager of the Woods Motor Vehicle Company and also a director of the Chicago Motor Club, accompanied by W. S. Peterson, has started from Chicago on a tour the itinerary of which calls for a jaunt of 2,000 miles and which will last 40 days. He expects to travel from 50 to 75 miles a day. The car is the same one in which Mr. Metzger recently drove with F. J. Newman from Chicago to Milwaukee on one charge in eight hours and a half, from Milwaukee to Sheboygan on another charge, and from there to Eikhart Lake, Wisconsin, and back to Sheboygan, a distance of 190 miles. This feat convinced them of the possibility of making a 2,000-mile run, taking in Peoria, Des Moines, Council Bluffs, Omaha, Lincoln, Kansas City and St. Louis.

"The object of our trip is to demonstrate the possibilities of the electric for daily consistent running," said Mr. Metzger. "We will have our batteries charged en route at the various electric lighting plants and at the same time we will instruct the workmen at those places how to properly charge the batteries of an electric automobile, in this way spreading the education and making it easier for the owners of electrics to travel from place to place."

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, August 11.—A series of tests carried out in Germany not long since showed that wireless messages could be sent very successfully from the ground to a balloon. This is the first time that such experiments were made with a non-captive balloon. The latter was sent up from the grounds of the military aerostatic detachment at Berlin, and in the basket was placed the different apparatus of the wireless post. Messages were then sent from a number of stations on the ground, one of these being placed at the balloon grounds. The stations of Nauen and Norddeich were also used to send the messages to the balloon. On the next day an airship was used in the experiments, and it likewise carried a complete outfit of apparatus. Messages could be easily received by the airship. The first trials were carried out at comparatively short range, but it is proposed to continue the experiments at greater distances.

Wireless operations are to be carried out on a large scale on the Continent by the Compagnie Francaise de Telegraphie Sans Fil (French Wireless Telegraph Company), which has now decided to increase its capital to $500,000. This company, which is headed by M. Victor Popp, a well-known promoter of engineering enterprises, was formed some years ago at Paris, and at that time it started to erect radio-telegraphic posts in France. The government, however, which has the monopoly of the postal, telegraph and telephone service, decided to include wireless telegraphy in the same category, thus excluding private companies from working in this field. The above-mentioned company was thus obliged to confine its operations to foreign countries. At present it has erected stations in Morocco at Tangier and three other points and in Roumania at Constantza and on different vessels. It is now to construct many other stations, among these being 24 posts in Spain and its possessions. The Spanish government recently awarded the contract for these stations to the present company, and the latter will operate them for a period of 22 years. Owing to this concession there has been formed a Spanish company whose headquarters are at Madrid. The French company has a controlling interest in the latter. It is proposed to make the system of Spanish posts, and especially the station of Gibraltar, one of the most important centers on the Continent, and it will be applied to sending messages to the different countries of Europe and principally for maritime signaling on the Atlantic and the Mediterranean.

A circular has been issued at Paris announcing that a number of leading electrical firms have made a combination as regards the manufacture and sale of alternating-current meters for central station and subscribers' use. Seeing that the induction type of meter is difficult to construct under the best technical and economic conditions without the use of patented devices, four of the principal companies have come to an agreement for the construction of meters, these being the Westinghouse Company, Ltd., of Paris, the Allgemeine Elektricitats Gesellschaft of Berlin, the Meter Company, one of the largest of the Paris firms for the manufacture of electric meters, and the Issy Electric Company of Paris. All the meters which use patents covered by the agreement are to have a standard seal or plate to this effect.

The accident which occurred not long ago at the Lötschberg Tunnel is likely to retard this work considerably. It took place in the north gallery of the tunnel, whose construction had been commenced in 1906 and now reached a length of 2,673 meters. Following a blasting operation the roof of the gallery was opened and the water entered the tunnel from the Kander River which lies above it. The water brought with it a great mass of sand and mud which filled up the tunnel for half its length. Twenty-five workmen were killed on this occasion, being buried in the tunnel. As the bed of the river is supposed to lie at 70 meters above the tunnel, it is thought that there was a depression in the river bed at this point. It will be remembered that the Lötschberg Tunnel, whose total length will be 13,700 meters, is to be used for the new electric railroad which will pass across the Alpine region and give access to the Simplon line.

A. DE C.

GREAT BRITAIN

London, August 14.—Systems of charging for electric supply have always been a source of anxiety to the central-station manager, and the general tendency at present is toward simplicity in contradistinction to the complication in regard to tariffs which seemed to be regarded a few years ago as a necessary adjunct to the use of electricity. Simplicity has certainly been carried a very long way in the latest system which has been introduced at the instance, I believe, of the engineer to the Norwich corporation, viz., based upon the ratable value of the premises supplied, in the form of a standing charge as a percentage of the ratable value plus a running charge of so much per unit. At Norwich the standing charge is 15 per cent., and this has now been adopted in some other towns. Colonel Crompton, who is a pioneer of electric supply in London, has laid it down emphatically that electricity, being as much a necessity as water, should be charged for on the same basis, and has expressed the firm conviction that this is what we shall come to eventually. But there are obvious difficulties in the way of applying the system universally, and the character of the town must determine even whether it can be applied. Those places which are giving it a trial do not boast of a preponderance of business premises, for it is interesting to call to mind the possibility of charging upon the ratable value basis on a business building. If an all-round percentage of the ratable value is to be charged as the standing charge, the man in renting the lighter rooms of the upper floors would surely have a grievance in regard to the lessee of a basement. The latest convert to this method is Nuneaton, the council having decided last week to give a trial upon the 15 per cent. rate, plus three cents per unit.

No less than $75,000 was paid away by the Manchester corporation last year as compensation for accidents upon its tramway systems, this amount being nearly 50 per cent. greater than that paid in the previous year. The reason for this adduced by the chairman of the tramways committee is that the people of Manchester are beginning to have a shrewder idea of the class of accident, however trivial, which they may now claim for with a chance of success.

An instance of the Dolter surface contact system proving unsatisfactory has occurred in Yorkshire, where a line had been constructed between Mexborough, Rawmarsh and Swinton. The line is now being converted to the overhead trolley system and a first section was opened a few days ago.

The synchronization of public clocks is receiving considerable attention just now. It is a notorious fact that few of our public clocks agree as to the exact time, and a committee of the British Science Guild has issued a memorandum on the subject. In this they suggest that all public departments showing public clocks should set the example, and that further, all persons showing public clocks by way of advertisement should be compelled to have them synchronized or take them down. It is understood that steps are being taken to carry out the recommendations of the committee of the British Science Guild so far as London is concerned.

A wireless telegraph station is to be erected close to Aberdeen by the Admiralty, and a supply of electrical energy has been arranged for from the Aberdeen corporation. The Admiralty has agreed to pay $750 per annum for three years, and seven cents per unit, in addition to paying $5,000 toward the cost of the necessary cable.

Since the competition from the Liverpool corporation tramways commenced the Liverpool and Overhead Railway Company's dividends have declined in a somewhat alarming manner. At the recent half-yearly meeting the chairman made the suggestion that as the railway was so essential to the trade from the docks, the Dock Board ought to subsidize it. He added, however, that there is little prospect of this at present.

G.

NEW YORK

New York City, August 22.—Practically the whole traction situation in New York as it refers to future construction of transit lines has been upset by the announcement made by President Charles S. Mellen of the New York, New Haven and Hartford Railroad Company that his company might enter the field here by building a subway of its own. Attention is now called to the fact that the New Haven road owns a large site on Park and Lexington avenues near Thirty-second Street, and rumors have been circulated that this may be used as the main Manhattan terminal of the new subway. It is pointed out, too, that the Pennsylvania tunnels, which run beneath Thirty-third and Thirty-second streets, would be directly below the New Haven's station if it were built on the lot mentioned. These tunnels, however, are on an exceedingly deep level, and the New Haven's tunnel down Lexington Avenue would be much nearer the surface, so that the two lines would in no way interfere. At the same time it would be possible to build a lower story or sub-basement in the New Haven's station, which would in effect furnish a station for the Pennsylvania trains running transversely across Manhattan. Such an arrangement would be of incalculable benefit to the traveling public passing through New York, as aside from the use of ferry boats to lighter the trains around the city such a tunnel connection would make it possible for the first time to run trains from the extreme west of the country through New York city to Maine without change. The New Haven road would prefer to consider using the present lines of the New York subway if such were possible, but the underground tracks are now taxed to their capacity and the latter's officials have refused to consider the proposition.

Pennsylvania Railroad electrical engineers have been making careful examinations of the electrical equipments of the present electrified roads operating in and about New York with a view to the most judicial selection of operating equipment for the new Manhattan terminal and tunnels. The party of experts, which included a number of practical steam railroad operating men, was shown over the New York Central electric zone last week and examined the locomotives, power supply and signals in use. The electrification of the Pennsylvania's New York terminal and its approaches will be one of the largest contracts of the kind ever attempted by a railroad. It is likely that the electrical features alone of the Pennsylvania's proposed improvements will cost in the neighborhood of $20,000,000. This will include the electric locomotives which will draw the express and local trains through the Hudson River tunnels, also the motor cars, power house and other equipment.

The order of the Public Service Commission demanding detailed information regarding the condition of the Hudson and Manhattan Railroad Company, which operates the McAdoo tunnels, has been blankly refused until the officials of the road are convinced the commission has jurisdiction. The company makes the plea that it is engaged in interstate commerce and has presented the New York utilities board with virtually no information about itself, except that bearing on the construction work in progress within New York city. In another year the tunnel company will have in operation its second pair of tubes, running under the North River from the foot of Cortlandt Street to Jersey City.

Chief Hazen, who is in charge of the laboratory of the Public Service Commission, says that all electric meters in the state must be regulated according to the Albany standard, and has sent out a circular to all the electric companies requiring them to provide themselves with standard testing instruments and to make reports each month of the use to which they are putting the instruments. The first report, which will be for the month of August, is due September 10th. Seventy meters have been inspected on complaint so far, and some of them have been found as much as 50 per cent. too fast. It was also found that many small companies had no testing apparatus, and that the standards in different parts of the state varied.

The receivers of the Metropolitan Street Railway, who were also, until recently, receivers of the New York City Railway as well, have made public a statement showing the income account of their property from September 25, 1907, when they were appointed, until the end of the fiscal year, June 30, 1908. This statement showed that with all the defaults in effect up to June the Metropolitan Street Railway system had a deficit of $1,047,682.38, without counting $344,882.83 further expenditures resulting from operation about which there is an open question whether they should be charged to the Metropolitan or to the New York City Railway.

Dr. Lee De Forest, the inventor, is quoted as prophesying that he expects within a year to connect New York city with Paris by wireless telegraph, and hopes soon afterward to bring about communication between the two cities by wireless telephone. He has signed a contract with the Metropolitan Life Insurance Company for the use of the lofty Metropolitan tower as a wireless-telegraph and telephone station, and he says that he has the assurance of Minister Piquart of France, of the most cordial assistance and the use of the Eiffel Tower for the experiments. Another feature the wireless company promises to exploit is the installation of apparatus to reproduce operatic music by wireless so that those several hundred miles at sea can hear music from the tower. W.

OHIO

Toledo, August 22.—More than 10,000 free street-car tickets were distributed for the use of the employes of the Toledo Railways and Light Company and their families last Monday. The occasion was the annual outing which was held at the Casino. Despite the rain hundreds were unable to gain admission to the immense theater. Baseball games were abandoned, but other sports which had been arranged were carried out according to programme. The outing was also participated in by the employes of the Toledo and Western, the Maumee Valley, and the Ottawa Beach and Northern railways.

Despite a petition bearing the signatures of 750 citizens of Lima, Ohio, the City Council this week passed an ordinance for the construction of a municipal lighting plant to cost $105,000. President Schoepf of the Lima Electric Light Company made a proposition for a much cheaper light, but was turned down.

Harry King, well known in Toledo as the wire chief of the Home Telephone Company at the East Side exchange, is dead. The body was taken to Norwalk, Ohio, for interment.

The city of Toledo will be one meshwork of electrical decorations during the week of the national encampment of the G. A. R. Electric arches, electric flags and multitudes of designs are being installed for the occasion.

The burning of a fuse caused a small panic on a street car at Toledo in front of the Wayne Hotel. The passengers were badly shaken up, but no serious injury resulted. When the flames shot into the car women jumped and screamed, many receiving bruises in falling to the pavement. Mrs. A. C. Jones was thrown to the floor and her clothing nearly torn from her body.

The defaulted July interest of the Toledo and Western, amounting to about $40,000, will be paid some time in December, according to President J. R. Nutt of Cleveland. Fred Bacon, Warren J. Bicknell and J. H. Ross, acting as a committee on behalf of the new organization, made a recent tour of inspection of tracks and other physical property, as well as of its finances.

Word comes that the Independent and Bell telephone systems in Preble County, Ohio, have been consolidated, to become effective on September 1st. The Preble County Telephone Company will take over the Bell exchange at West Elkton, with 140 subscribers. The Bell will continue to control the long-distance service.

The National Machinery Company will make extensive improvements at its plant at Tiffin, Ohio, in the near future. The changes have been planned by A. H. Smith, consulting engineer of Toledo, and will embrace a 50 per cent. enlargement of floor space. Three gigantic electric cranes will be installed and the lighting increased to four times its present capacity. H. L. S.

INDIANA

Indianapolis, August 22.—The Seymour and Brownstown Construction Company has been organized to construct an electric railway between Seymour and Brownstown, a distance of 12 miles. Surveyors are at work on the right-of-way. The people in the two towns and along the right-of-way have long desired a trolley line, and are taking much interest in the enterprise.

The Terre Haute City Council has approved the Grand Central Traction Company franchise. According to the franchise the company, which proposes to build an electric line from Indianapolis to Evansville, with a branch from Bloomington to Terre Haute, was granted a 40-year right to cross certain streets within the city, the company posting a $15,000 forfeit as a guarantee that the terms of the contract will be carried out and cars be in operation within two years.

Plans have been made for a motor-car service on the Southern Railway between Louisville and Corydon Junction. The cars will be operated by gasoline and will have a capacity of 20 passengers. This step will likely be followed by other steam railroads for suburban transportation.

Officials of the Indianapolis, Columbus and Southern and the Indianapolis and Louisville Traction Company held a conference in Columbus on the 20th inst., and made arrangements for a limited fast through-line service between Indianapolis and Louisville. The service already inaugurated has proven so popular that it is deemed advisable to put on additional limited cars and lower the schedule.

In making a change in its roadway, the Michigan Central Railroad Company abandoned the strip of land five miles in length on the line between Indiana and Michigan. The land was subsequently purchased by J. C. Goodrich for $1,006. He is now offered $5,000 a mile for the narrow strip by the promoters of a new traction line.

A company of officials of the Ohio Electric Railway Company and other electric-railway companies centering in Dayton, Ohio, were in Indianapolis during the last week to make a critical examination of the Indianapolis Traction Terminal station, with a view of gaining data for the purpose of constructing a similar interurban terminal station in Dayton, Ohio.

The largest electric locomotive in Indiana has just been turned out at the central shops of the Indiana Union Traction Company at Anderson, for its own use in moving steam-railway cars of coal and other heavy loads about the power house and shops of the company. This electric engine is valued at $5,000. The principal dimensions of the machine are: Length over all, 30 feet; width, 7 feet 6 inches; height, 12 feet; length of wheel base, 24 feet; weight on drivers, 80,000 pounds; electric horsepower applied to drivers, 800. The work of building the locomotive was in the charge of R. C. Taylor, superintendent of motive power, M. Skouden, shop superintendent, and H. A. Nichol, general manager of the company. The locomotive is equipped with automatic brakes, M. C. B. couplers, double pneumatic sanders, locomotive bell, double headlights, pantagraph trolley and all the latest devices for controlling purposes.

The Citizens' Telephone Company at Decatur, Ind., is not anxious to push its suit against the Decatur and Fort Wayne Traction Company for damages on account of induction from the traction line, which carries a high-tension alternating current. It is proven conclusively that the traction line between Decatur and Fort Wayne, as well as other traction lines in this state, are operating telephone lines very successfully which are strung on the trolley poles from five to 10 feet distant from the high-tension wire. Such proof as this would likely demonstrate that it is the fault or lack of proper construction of the telephone wires and not the induction of the current.

Prof. J. Walter Esterline of Purdue University has submitted to the Board of Public Works of Logansport plans for the construction of a new municipal light plant. The plans provide for the installation of a new 500-kilowatt, 60-cycle turbo-generator and also a 150-kilowatt generator, which will be belted to a Buckeye engine. The city arc lights are to be changed and a new smokestack is to be built. More waterpower is to be used than heretofore, and according to his plan there will be an annual saving of $9,000 in coal bills and about $1,000 in arc-light bills, besides an increase in power from 600 kilowatts to 700 kilowatts. Professor Esterline has been engaged to supervise the purchase and installation of the new equipment.

The steam and interurban railway company and the City Council of Lafayette have compromised in the matter of erecting and maintaining electric lights at their crossings in the city. Under the compromise the railway companies will pay 25 per cent. of the cost of maintaining such lights by the city and contribute $1,000 toward the installation of the additional lights necessary.

By order of court, the property of the Citizens' Heat and Light Company of Elwood will be sold to the highest bidder on September 18th. The company owns the electric-light plant and also all of the gas interests of Elwood, which were pooled when the heat and light company was organized. A default in payment of the interest on bonds occasioned the sale. It is understood that the sale will be followed by the organization of another company with more local capital than is now interested in the plant.

The Acme Electric Company of Washington, Ind., has filed articles of incorporation with the secretary of state. The company proposes to manufacture, buy and sell all kinds of electric equipment for the installation of plants and power stations. Roy W. Eves is president and E. M. Robertson secretary.

The Public Service Telephone Company of Leesburg has filed articles of incorporation by H. E. Kinsey and others. It is the purpose of the company to commence at once the installation of an entirely new telephone system. The company's capital stock is $20,000.

The Mutual Telephone Company of Shelburne is preparing to purchase new equipments for the improvement of its plant.

The Citizens' Telephone Company of Terre Haute has entered upon the work of extending its lines in order to accommodate a large number of new subscribers.

As the result of handling brass plugs at the Whiting switchboard, Whiting, Ind., several telephone girls have been made sick, some of whose lives are despaired of. Symptoms of lockjaw developed and physicians say that they have a very slim chance for recovery.

The suit brought by the prosecutor of Marion County against the Indianapolis Telephone Company, to enjoin the company from accepting the new franchise recently granted by the city, and which was venued to Hendricks County, has been venued a second time to be tried by Judge Artman of the Boone Circuit Court, at Lebanon. S. S.

ILLINOIS

Peoria, August 22.—The line from Seneca, through Morris to Joliet, connecting the present lines of the Illinois Traction Company with Joliet will be built as soon as the financial situation clears up sufficiently to warrant going ahead; such is the definite statement by H. E. Chubbuck, manager of the traction company's lines. At a conference between Manager Chubbuck and Congressman McKinley in Chicago this week the matter of building this line was gone over with the above result. While it is doubtful whether the line will be built this year, everything will be in readiness to commence operations early in the spring, so as to have the line completed in time for the summer business.

The Western Union and the Postal Telegraph companies have been notified by the City Council that they must at once proceed with the underground work that they were to have completed, a resolution ordering them to comply with the ordinance at once being passed by the Council.

The Exchange Telephone Company of De Kalb has increased its capital stock from $25,000 to $50,000.

A committee from the Farmers' Mutual Telephone Company of Tazewell County met with the attorney of the Union Independent Telephone Company to see whether the old company could be bought, but no satisfactory agreement could be arrived at.

The Farmers' company is building a central office at Groveland and will be in position to start building the lines in a few days, and subscribers are promised good service at a reasonable rate.

C. F. Handshy of Springfield, who is superintendent of transportation for the Illinois Traction System, is arranging a new time card for the line between Springfield and Danville, that will go into effect the first of September. It calls for 10 limited through cars daily between the two cities. On the other two branches from Springfield there will be practically no changes.

The Peoria Railway Company is disposing of the old cars that were formerly in service here and that have been replaced with the new and larger types. Four were shipped to Argenta, Ark., this week after they had been overhauled and repainted and four were recently shipped to Keokuk, while a number have been disposed of to parties for summer cottages.

The Illinois Traction System has moved into the new station that it has been remodeling for its needs in Springfield. The building was formerly occupied by the Springfield Consolidated Railways Company, but has been leased for a long period to the traction company, which has spent several thousand dollars in fitting it up for the combined passenger and train sheds, so that the passengers will not have to go out in all kinds of weather to board the cars. The necessary quarters for the selling of tickets and checking of baggage have been provided and a separate office for the telephone operator, as the company dispatches the trains by telephone. This station is now the most complete one on the system.

General Manager Fischer of the Illinois Traction System is authority for the statement that the system will in two years' time be connected with Terre Haute, Ind. All that stands in the way of building the connecting link has been the money market, and as soon as the money market eases up the two companies will be able to get together and make arrangements for the running through of the cars between Danville and Terre Haute. The line from Danville to Ridgefarm will have to be rebuilt for through traffic, and it may be necessary to build a double track to care for the traffic.

The Peoria Railway made a record for travel on Wednesday, this week, when Ringling's Circus was here, hauling 76,569 passengers. The traffic was handled without an accident, the receipts for the day being the largest in the history of the line.

The Rock Island, Moline and Davenport Suburban Railway Company has certified to a change of name from the above to Rock Island and Southern Railway Company.

The Pfanstiel electric laboratory has certified to an increase of capital from $20,000 to $30,000.

The Electric Rotary Floor Polisher Company of Chicago has changed the name to Electric Rotary Machine Company. V. N.

NORTHWESTERN STATES

Minneapolis, August 22.—The Aberdeen Street Railway Company of Aberdeen, S. D., was incorporated for $250,000 by Charles T. McCoy, Frank H. Hagerty and other leading business men of that city.

The city of Brainerd, Minn., is offering $120,000 bonds for sale for the purpose of constructing an electric-light and waterworks plant.

The Wisconsin State Railroad Commission has decided that if the village of Cashton wishes to construct a municipal power plant it must buy out the existing private plant.

A conference was held in Charles City, Iowa, looking to the construction of an electric line from that city to Des Moines by way of Greene, Allison, Parkersburg, Grundy Center, Conrad and Marshalltown. The road will cost in the neighborhood of $2,000,000.

The old-style 32-candlepower incandescent street lights in use in Council Bluffs, Iowa, are being replaced with 40-candlepower tungsten lamps.

The Dodgeville Electric Light and Power Company of Dodgeville, Wis., will erect a new plant, 40 by 70 feet, and install a 100-horsepower boiler and engine. An ice and heating plant may be operated in connection with the new plant.

The Huron Street Railway Company of Huron, S. D., has been incorporated for $50,000 by Norton D. Walker of Milwaukee, W. D. Coler of Brooklyn, John W. Smith, Frank E. Stevens and Harry N. Jewett of Huron. The company will construct 10 miles of line.

Frank Benjamin of Galesburg, Ill., proposes to build an electric-light plant in Iowa City, Iowa, supply the city at the same rates as the present company, and at the end of 25 years hand over the plant and equipment to the city free. If the city does not want it then he will give $25,000 in cash.

The McCook Electric Light Company of McCook, Neb., offers to build a new plant at a cost of $35,000 as soon as a franchise is granted.

At Minneapolis the City Council has deferred a consideration of the electric-franchise ordinance, vetoed by the mayor, till the meeting of November 27th.

The Board of Education of Minneapolis has let the contract for furnishing motors for the four high schools to the Electric Machinery Company for $1,828.

A dam, 3,500 feet long and developing 3,000 horsepower, will be built by the Green Bay and Mississippi Canal Company at Kaukauna, Wis.

Contracts will soon be let for the waterpower plant which the Light and Traction Company of Marinette, Wis., will construct at Grand Rapids, Wis.

The Nebraska Power Company of Columbus, Neb., offers to furnish the city of South Omaha with 15,000 horsepower electric current for municipal use.

The Wisconsin Electric Railway Company of Oshkosh, Wis., was incorporated by Oliver C. Fuller, Fred C. Best and Russell L. Smith, with a capital of $350,000. It succeeds the Winnebago Traction Company.

Ira Knapp of Mason City, Iowa, has purchased the roller mills at Portland, Iowa, in order to secure cheaper power for the Mason City Vulcan Iron Works. It will be transmitted electrically four miles.

The Union Power Company of St. Cloud, Minn., has filed a trust deed with the Minnesota Loan and Trust Company to secure a bond issue of $500,000, to be applied as follows: For the construction and equipment of a power plant, $150,000; for the installation of local and long-distance transmission lines, $150,000; for the purchase of street-car lines, $150,000, and for the installation of pulp mills, $50,000.

A street-lighting system will be installed at Scotland, S. D., but the kind has not yet been determined.

The City Council of Washburn, Wis., has voted to annul the purchase of the electric-lighting system from the Washburn Electric Light and Power Company. The city paid $22,580 for the plant.

The Northwestern Telephone Exchange Company will contest in the courts any attempt on the part of the City Council of Minneapolis at regulating its rates upon the basis proposed—$48 per year for business connections. Doubtless the company will do likewise in St. Paul, where a similar action is threatened in the Council.

The ordinance giving the Tri-state Telegraph and Telephone Company of Minneapolis authority to collect a 25-cent penalty on delinquent monthly telephone bills was not reported to the City Council, though approved by the committee on telephone rates.

C. M. Mauseau of Minneapolis, Minn., general manager of the Northwestern Telephone Company and the Duluth Telephone Company, says that plans are being made to improve the long-distance service at Duluth, Minn., and Superior, Wis., by laying heavy trunk cables between the cities.

The question whether the Zenith Telephone Company of Superior, Wis., shall be permitted to charge higher rates will be submitted to the voters at the fall election. No dividend has been paid on the common stock for eight years.

The Hutchinson Telephone Company of Hutchinson, Minn., and the McLeod County Telephone Company have arranged to make connections between Hutchinson and Silver Lake.

There are 1,000 telephones in the Northwestern Telephone Exchange at Jamestown, N. D., being one to every six people.

The North Dakota Independent Telephone Company has about completed its line from Bismarck to Napoleon, N. D.

The Northwestern Telephone Exchange Company has improvements under way in St. Paul which will cost about $250,000. The party-line service is remodeled, doing away with lettered calls, so that all calls will be on straight numbers. The main exchange is to be designated as "Cedar" instead of "Main," owing to some confusion arising from Minneapolis and St. Paul both having "Main" calls, and also from the fact that "Dale" is often mistaken for "Main."

The Hebron Telephone Company of Hebron, Iowa, was incorporated for $5,000 by H. E. Edmondson, C. Augustine and others. The object of the corporation is the maintaining of mutual lines in Adair and adjoining counties.

Messrs. Babcock and Jansen have sold their telephone system in Wyoming, Iowa, to Otto Wettstein, Jr., Laporte City, Iowa, who has controlling interests in telephone plants in Anamosa, Monticello, Maquoketa and other towns in Iowa and Nebraska. The system will be maintained as a separate company and will be incorporated as the Wyoming Telephone Company. R.

WESTERN CANADA

Winnipeg, August 22.—Francis Dagger, who is in charge of the telephone work of the Saskatchewan government, will speak on the western situation at the third annual convention of the Canadian Independent Telephone Association.

F. E. Cambridge, city electrician of Winnipeg, is now touring a number of American and Eastern Canadian cities for the purpose of finding out what steps are generally taken to guard against damage by electrolysis.

Elliott & Welch of Boissevain, Man., have received the contract for the construction and installation of a telephone system throughout the municipality of Morton.

About a year ago the Council of the municipality of South Norfolk, Man., received a petition from the ratepayers asking for the installation of a municipal telephone system, providing it could be put in at a cost not exceeding $15 per year per telephone. A few weeks ago the municipal clerk received specifications and estimates from the Manitoba Telephone Commission, Winnipeg, showing that the system would cost $17.80 per telephone per year. The clerk of the Council is now making the necessary explanations to the petitioners. Address R. J. Mills, Treherne, Man.

Sealed tenders will be received by A. P. Power, secretary-treasurer, Virden, Man., until noon, August 31st, for the installation of a complete telephone system throughout the rural municipality of Pipestone. Plans and specifications may be seen at the municipal offices at Virden and also at the offices of the Manitoba Telephone Commission, Winnipeg, Man.

After trying a number of styles of street-car fenders, the Civic Board of Control at Winnipeg, Man., and the Winnipeg Electric Company have agreed that the Jenkins protruding fender would be the most serviceable for the company's cars in and around Winnipeg.

It has been decided to delay no longer the development of municipal power at Lac du Bonnet, Man., to supply Winnipeg, and the City Council has instructed W. Sanford Evans, controller, to arrange for disposing of sufficient bonds to carry out the work.

Among the new telephone systems being constructed and organized in Saskatchewan, companies are being organized to provide systems in the following towns: McTaggart, Aberdeen, Yellow Grass, Wilcox, Wadena, Condie, Esterhazy, Elmore, New Osgood, Weyburn, Briercrest, Estevan, Rouleau, Sedley, Walmsley, Saltcoats, Melfort, Maple Creek, Swift Current, Hanley and Balgonie. Address Francis Dagger, telephone expert, Regina, Sask.

The City Council of Victoria, British Columbia, is of the opinion that the British Columbia Electric Street Railway Company has no powers to haul freight through the streets of that city. This subject has been the cause of much controversy in Victoria for the last year, but the question is now no nearer settlement than ever. At the last meeting of the Council several of the aldermen stated they would like to see a decision of the case handed down by the courts, but were not willing that the expense should be borne by the city.

The electric tramway being built by the city of Winnipeg at the power site at Point du Bois will be completed in a few days. The line is 23 miles long and includes a steel bridge over the Winnipeg River, 1,000 feet in length. Cecil B. Smith, civic power expert, still has charge of the work. R.

TEXAS

Austin, August 22.—There are a number of interurban electric-railway projects on foot in Texas in addition to the lines now under construction. This state is an inviting field for interurban builders. There are many populous localities which would, it is claimed, afford a heavy traffic for electric lines. So far comparatively few interurban roads have been built in Texas. The territory around Dallas and Fort Worth is now being exploited with these enterprises to a considerable degree, and prospective investors are investigating the situation in other parts of the state with the view of building interurban electric lines.

The delay in building the proposed concrete causeway across Galveston Bay, to connect the city of Galveston with the mainland, is said to have seriously interfered with the plans of the Stone-Webster syndicate of Boston, Mass., for the construction of an interurban electric railway between Houston and Galveston. The distance between the two cities is 51 miles. The route of the road has been located and everything is said to be in readiness for building the line as soon as plans for building the causeway have progressed sufficiently. Galveston County has issued bonds to bear its proportion of the expense of building the causeway and construction work upon the structure will be started as soon as the several railroads which expect to enter Galveston over the proposed structure have become parties to the proposition. The proposed electric line has agreed to bear its share of the expenses of the structure. The causeway will be two miles long and will be of sufficient size to accommodate the railways, electric line, wagon road and foot passage across the bay.

It is reported that H. M. Hyatt of Kansas City, Mo., and associates who are promoting the building of an interurban electric railway between Waco and Fort Worth, a distance of about 90 miles, are meeting good success with their plans and that they expect to have things in readiness for pushing work on the project this fall. The same interests expect to build street-railway systems in intermediate towns.

The project of building an interurban electric line between Austin and Lockhart has been revived. New York men are said to be interested in the scheme. The Business Men's Club of Austin has the matter under consideration. The distance between the two places is about 28 miles.

Dr. C. F. Simmons, a millionaire ranchman and promoter of San Antonio, is planning to build either an electric or steam railway from San Antonio to Simmons City, a town which he has established upon one of his ranch properties about 30 miles south of San Antonio. He makes the positive announcement that the road will be built without dalay.

An extension of the Houston electric-railway system is being built from Houston to Harrisburg, a distance of about 10 miles. It is a Stone-Webster project. It is expected that the line will be finished and ready for operation some time in October.

It is planned by the Temple and Marlin Electric Company to begin construction work soon on the interurban electric railway which it will build between Temple and Marlin, by way of Belfalls, Salado and other towns. The proposed line will be about 50 miles long.

The building of an electric railway down the valley of the Rio Grande, between Las Cruces, N. M., and El Paso, a distance of 45 miles, is said to be practically assured. The company which will undertake the work is called the Mesilla Valley and El Paso Railway Company. It has a capital stock of $1,000,000. The consummation of the great land-irrigation project which the federal government is now building near Las Cruces is expected to bring about a marvelous development of the lands of the Rio Grande Valley and to cause the territory to become thickly populated. It is in order to handle the existing as well as the prospective traffic that the building of this valley railway is proposed. The incorporators are men of means and enterprise and are pushing the preliminary plans with energy. The headquarters of the company are at El Paso.

S. W. Fordyce of St. Louis, Mo., and associates, who several months ago purchased the horse-car line that connects the ferry landing on the Mexico side of the Rio Grande opposite Brownsville, Tex., with the town of Matamoros, will rebuild the road and equip it with electric traction as soon as the proposed bridge across the Rio Grande at that place is built. It is planned to then extend the line across the international boundary stream and to build an extensive system in the town of Brownsville. The line will also make connection with the railway which now runs between Brownsville and Point Isabel, a noted pleasure resort upon the Gulf coast, 22 miles from Brownsville. It is proposed to convert this short line from steam to electric traction. It is also owned by Mr. Fordyce and associates. That section of the Rio Grande Valley is settling up very rapidly, and the matter of building an electric line between Brownsville and points situated up the river within a distance of 50 miles is being considered by extensive property owners of that section. W. D. H.

PACIFIC SLOPE

San Francisco, August 19.—Electrical interest in and about San Francisco is now mainly centered about the late developments in interurban electric-railway matters. This week moves have been made by all three of the companies which are planning electric roads between San Francisco and San Jose, 50 miles south. The Southern Pacific company, one of the Harriman steam-railway properties, which already owns the Peninsular Railway, with valuable electric-railway franchises in San Mateo and Santa Clara counties, has just bought the interests of John Martin and L. E. Hanchett in the Santa Clara County Railroad and the Santa Clara Interurban railroad, together with franchises owned by these roads. The new owners say that the franchises of the Santa Clara Interurban, the Peninsular Railroad and the San Francisco and San Jose steam line of the Southern Pacific, which has been largely abandoned as a steam line since the completion of the Bay Shore Cut Off a year or so ago, will be used in the operation of an electric railroad from San Francisco, through San Jose and Santa Clara to Los Gatos, a total distance of about 60 miles.

It is generally held that this move of the Harriman interests is intended to anticipate both the proposed move of the United Railroads of San Francisco to extend its electric lines down the San Francisco peninsula to San Jose and the proposed plan of the San Francisco, Oakland and San Jose Railroad Company, otherwise known as the Key Route System, to connect San Francisco with San Jose by means of an extension of its electric line down the east side of San Francisco Bay.

As an offset to the latest move of the Harriman interests, the San Francisco, Oakland and San Jose Railroad Company this week executed a deed of trust of its properties to the Union Trust Company of this city to secure the payment of $7,500,000 in bonds, $3,000,000 of which will be available for the proposed extension. This company has also taken over the property of the San Francisco and Bay Cities Railroad Company as a preliminary move.

The United Railroads of San Francisco has issued an announcement that by September 1st it will have completed the installation of a new 5,000-kilowatt Curtis turbine. The new equipment includes a consignment of machinery valued at something over $500,000 from the General Electric Company. The new installation will increase the company's available power about 30 per cent., the present supply being 16,500 kilowatts.

The Board of Public Works of Los Angeles will receive bids until August 31st for furnishing the municipality with the necessary hydraulic and electrical machinery, apparatus and line material to equip one hydro-electric generating plant of 600 kilowatts capacity, and about 50 miles of 30,000-volt transmission line, the whole being for use in the construction of the Owens River aqueduct system of water supply for the city. Aqueduct bonds to the amount of $4,000,000 were sold on August 12th, bringing the total amount sold up to $8,000,000.

Application has been made by the California Electric Light Company of San Francisco for permission to dissolve the corporation. The hearing will come up on September 16th.

The California and Nevada Power Company has secured an extension of its option on the Fleishhaker electric properties in and about Reno, Nev., until November 1st. The properties affected are those of the Reno Power, Light and Water Company, the American River Electric Company, the Truckee River General Electric Company and the Nevada Traction Company.

The Kaweah Southern Power Company has been incorporated in Oakland, Cal., with an authorized capital stock of $2,500,000 by R. W. Kitrelle of Berkeley, Cal., W. Gabriel of Berkeley, F. C. Watson of Oakland, A. H. Dale of Oakland and Russell McHenry of Piedmont, Cal. The company plans to develop power for long-distance transmission from the waters of the Kaweah River in Tulare County, Cal.

A special meeting of the stockholders of the Eel River Power and Irrigation Company has been called in San Francisco for the purpose of considering the dissolution of the corporation. The meeting will be held on August 25th.

Mike Flynn has appropriated 19,000 inches of water from the Feather River in Northern California for power purposes. The water will be taken from the river at a point near Oroville, Cal.

The Nevada Power Company, which has an option on the plant of the Bishop Light and Power Company, at Bishop, Cal., has removed the water-wheel and pipe line of the plant and has installed them at Hillside Lake, where it is driving a 2,000-foot channel. This is taken as an indication that the option will be taken up before its expiration.

An election has been called at Cottage Grove, Ore., for the purpose of voting on the question of granting a 25-year franchise to the Cottage Grove Electric Company.

An ordinance has been introduced at Seattle, Wash., providing for the issuance of bonds to the amount of $400,000 for improvements and extensions to the municipal lighting plant.

Advices from Seattle, Wash., state that the Wellman-Seaver-Morgan Company of Cleveland, Ohio, was the lowest bidder on the electric cranes to be erected at the Puget Sound navy yard, the company's bid being $230,000. The amount available for the work is $250,000.

E. H. Kramer, representative of George Heazelton of San Francisco, principal owner of the Humboldt Transit Company, states that bonds to the amount of $100,000 will be floated for the purpose of making extensions to the company's electric-railway system in Eureka, Cal. This will bring the total bonded indebtedness of the company up to $300,000.

The Riverside and Arlington Electric Railway Company of Riverside, Cal., one of the Huntington properties in Southern California, has secured an additional electric-railway franchise in Riverside.

The municipal authorities of Willows, Cal., are advertising for sale a franchise for a telephone system in that place, bids to be received not later than September 10th.

The Board of Supervisors of Monterey County, Cal., has granted the Peach Tree Rural Telephone Company a franchise for a telephone line along the county road from King City to Slack's Canyon. A.

MEXICO

Mexico City, August 19.—The Tri-state Development Company now owns the federal concession which was granted to J. F. O'Gorman for the installation of a large hydro-electric plant on the Fuerte River, in the state of Sinaloa. The company will soon begin the construction of the plant. The surveys and plans have been made by A. M. Nelson and were recently submitted to the government for approval. They call for the development of 15,000 horsepower at lowest water. The plans include the construction of a dam of reinforced concrete, 1,000 feet long across the crest and a power house to be built of the same material. The water in the river will be raised about 100 feet by this dam. The Kansas City, Mexico and Orient Railroad will pass close to the site of the plant, and it is reported that that road may use electric power to operate its trains over the mountain division. The Tri-state Development Company is composed of men who are also interested in this railroad.

Preliminary work necessary to the installation of a new hydro-electric plant for furnishing power and lights for this city was recently begun by Veyan, Jean & Co., who obtained a concession from the federal government for the project. They deposited $20,000 with the government as a guaranty that they would comply with the terms of the concession. The initial power for the proposed plant will be obtained from the Alameda River, and a canal is now being built to divert water from that stream for the purpose of operating the hydro-electric plant. It is planned to develop about 8,000 horsepower. The transmission line to this city will be about 45 miles long.

It is shown by recent surveys that approximately 200,000 horsepower may be generated on the Santiago River in the vicinity of Guadalajara within a distance of 60 miles. Concessions have already been granted by the government for the installation of hydro-electric enterprises covering about 115,000 horsepower on this part of the river. The Compania de Tranvias, Luz y Fuerza de Guadalajara, which operates the electric street railway and light and power plant at Guadalajara, has 11,400 horsepower available at the falls of Juanacatlan, where its hydro-electric plant is situated. Manuel Cuesta Gallardo holds a concession for the development of 50,000 horsepower on the river and he is arranging for the installation of the plant, with the view of furnishing lights and power for Guadalajara. The Perez-Vasquez-Rogers syndicate holds a concession for the development of 42,000 horsepower and is now arranging to begin the installation of a hydro-electric plant on the river within convenient distance of Guadalajara. It is shown by the recent survey that along the lower course of the Santiago River, within 100 miles of Guadalajara, additional power to the amount of 125,000 horsepower is available. No concession has been granted for this, however.

Steps have been taken to install a hydro-electric plant at the Faretan Waterfall near the town of Atotonilco, state of Jalisco, by the Atotonilco Light and Power Company. The falls have a drop of 75 feet, and it is said that a large amount of power can be generated. It is planned to build transmission lines to the town of Atotonilco and other industrial places in that district. Enrique Alvarez del Castillo is president.

S. Fred Ossolinski and associates, who own the rich Ojo Verde copper mines near Autlan, state of Jalisco, recently completed the survey for a series of hydro-electric plants which they have planned to install on the Ojo Verde River. By digging a canal about 2,500 feet long a fall of 350 feet will be obtained, with an available horsepower of about 500. The initial plant will be installed at this point and the water carried further down the river to the site of the second plant, which will also be of about 500 horsepower. The power will be utilized in the mines and mills in the district.

The Guanajuato Mining and Milling Company has just installed a large amount of electrical equipment in its mines and mills at Guanajuato. It receives its power from the Guanajuato Power and Electric Company, whose large hydro-electric plant is situated at El Duro, state of Michoacan.

A new electric-light and power plant was recently installed in the town of Matamoros, state of Puebla, by Victor Villar & Co.

It is reported that the Compania Agricola y de Fuerza Electrica will soon begin the construction of a large hydro-electric plant on the Conchos River, in the state of Chihuahua. The plans call for the installation of a 28,000-horsepower plant and the building of transmission lines to the cities of Chihuahua, Parral and other industrial centers of that state. A large dam will be built across the Conchos River to store water for initial power purposes.

A syndicate of Canadians and Germans is arranging to install a hydro-electric plant at La Joya, also on the Conchos River, for the purpose of generating power, which will be transmitted to a number of towns in the state of Chihuahua. It is planned to develop about 12,000 horsepower at this plant.

The Parral Electric and Water Company has placed its power plant in thorough repair and will soon resume operations, it is said. The company furnishes lights for the city of Parral and the town of Minas Nuevas, also for the famous Palmilla mine and the street railway of Parral. Its plant was shut down about six months ago and all the power since then has been generated by the Parral Power and Reduction Company.

The Mexican government has granted a large number of concessions recently for the installation of hydro-electric plants in different parts of the country, among the more important ones being the following: To Gonzales Carranza, for a plant on the Navosaigame River, state of Chihuahua, the power to be utilized in the mines of Roncesvalles y Anexas; to Manuel Gomez Pezuela and associates, for a plant on the Amacusac River, state of Morelos; to Jesus Trillo, for a plant on the Bovos River, state of Vera Cruz; to Pascual Trulls, for a plant on the Tamaom River, state of San Luis Potosi; to Robert L. Kayser, representing the Teznitlan Copper Company, for a plant on the Atoyac River, state of Oaxaca; to Miguel Bolanos Cacho, for a plant on the Coxapa River, state of Puebla; to Juan Alonzo, for a plant on the Molino de Calderon River, state of Mexico; to Fernando Duret, for a plant on the Balsas River, state of Guerrero; to W. O. Temple, for a plant on the Mayo River, state of Sonora, and to Jose F. Buel for a plant on the Ameca River, state of Jalisco. H.

PERSONAL

Mr. B. P. Bailey has resigned the position of city electrician of Hastings, Neb., to accept an appointment as manager of the electric plant at Pasco, Wash. He has been succeeded by Clive R. Morey, a recent graduate from the electrical engineering department of Armour Institute, Chicago.

Mr. W. B. Johnson, who has been in charge of the new-business department of the Rockford (Ill.) Electric Company, will take up a similar position with the Muncie (Ind.) central-station company. During his 18 months of service there Mr. Johnson has made Rockford one of the best lighted towns of its size in the country. Mr. Johnson remains in the same employ, as the American Gas and Electric Company controls both the Rockford and Muncie plants.

James B. Nelson, general manager of the Merchants' Heat and Light Company of Indianapolis, died last week at his home in Indianapolis. Mr. Nelson was one of the most prominent and best qualified civil and electrical engineers in Indiana, having spent years of service with the government and later with the city of Indianapolis. He was 43 years of age. After graduating in civil and electrical engineering at the Michigan University, he devoted the rest of his life to the engineering profession.

ELECTRIC LIGHTING

Scotland, S. D., will install an electric-light system.

Cumberland, Wis., is having plans prepared for a municipal electric-light plant.

Cedarsburg, Wis., will vote on the issuance of $15,000 in bonds for an electric-light plant.

The Peaks Island Water and Light Company has been incorporated for $20,000. E. E. Rounds of Portland, Ore., is president.

The Royalton (Minn.) Power and Light Company has been incorporated by A. C. Wilson and others, with a capital of $10,000.

By an order of court the city of Chilton, Wis., has been enjoined from proceeding with the erection of its proposed lighting plant. Until this has been dissolved no further steps can be taken in regard to the proposals that were sought from bidders on the necessary material and machinery.

The Atotonilco Light and Power Company has just been organized at Guadalajara, Mexico, with a capital of $50,000 to install a hydro-electric plant and furnish light and power to the town of Atotonilco and to haciendas and industrial plants in the tributary territory. Atotonilco is the center of the orange district of Jalisco. In the generation of current the company will utilize the 75-foot fall of the Faretan River, nearby.

ELECTRIC RAILWAYS

Bids will be received until September 25, 1908, by the Direction de Obras Públicas, Madrid, Spain, for the construction and operation of electric "tramways" in Madrid. A deposit of 5,185 pesetas (1 peseta equals 19.3 cents), must accompany all bids.

The property and right-of-way of the Santa Clara (Cal.) electric railway has been purchased by the Southern Pacific Railroad, which proposes to build at once and to operate an electric railway between Santa Clara and San Mateo, thus giving San Jose electric-railway connection with San Francisco.

The Houghton County Traction Company of Houghton, Mich., has contracted with the Stone & Webster Engineering Corporation for the extension of its lines from Wolverine to Mohawk, Mich. The contract includes the construction of the track, bridges, overhead work, a car barn, a small sub-station and the purchase of some new cars. The work as planned will cost about $125,000.

The Ohio Electric Railway Company will transfer its traffic headquarters to Cincinnati. The passenger and freight departments of the system, formerly directed from Columbus, will be separated and W. S. Whitney, well known to the railroad world, is to be the general passenger agent, and John C. Forester will be the general freight agent. They will have their offices in the Traction Building, Cincinnati.

A new street-car line across the southern and western edges of the Chicago business district is being planned so as to connect all of the six large railroad depots of the city. This line will enable passengers to travel directly from any depot to any other without being carried through the most congested district. Being less than two miles in extreme length and carrying the bulk of its passengers for much shorter distances, this line promises to be an exceedingly profitable one.

Preparatory to making definite plans for a system of traction subways in the center of Chicago a bureau to compile the preliminary information has been formed of some 15 engineers, investigators and draftsmen. One of the first tasks to be undertaken is the preparation of a series of maps showing the exact location and size of all underground pipes, conduits, manholes, sewers, etc., in the downtown streets. These will show also the character of the soil, occupation of subsidewalk space, location of foundations of buildings, bridges, elevated railways and all underground tunnels and other structures.

Cute little electric railroads which, according to the architects' plans, were to have connected the Capitol at Washington with the new Senate and House office buildings, will not be installed as contemplated, at least not contemporary with the completion of the tunnels which the statesmen traverse. The subways are to be finished with a coat of white cement, giving an excellent reflecting surface, but the travel in the subways will be on foot, except that freight will be handled on rubber-tired electric trucks. The House Building Commission, consisting of Speaker Cannon, Representatives Hepburn and Richardson, has not been enthusiastic over plans for subway electric trains, moving platforms, or any other of the various devices submitted for handling traffic between the Capitol and the office buildings. To install an electric road over the present routes from the Capitol to the House building and from the Capitol to the Senate building would cost from $80,000 to $100,000, it is estimated, and to operate it would cost about 15 per cent. of that sum annually, perhaps more.

POWER TRANSMISSION

A power dam on Billings Lake is being rebuilt on a larger scale than the old structure carried away last spring, and will furnish electrical power to Manton, Mich.

The Stone & Webster Engineering Corporation has purchased from the Grays Harbor Commercial Company about 2,000,000 feet of timber for building the cofferdam in the construction of the new 20,000-horsepower Hauser Lake Dam, which it is erecting for the United Missouri River Power Company on the Missouri River, near Helena, Mont.

The Little Muskegon Power Company has secured the available dam sites and flowage rights of the Little Muskegon River, together with the water rights, mill and property of the Morley (Mich.) Milling Company, and proposes to furnish electric light and power to Morley, Howard City, Lake View, Sand Lake, Pierson, Cedar Springs and other towns in the vicinity of the waterpower development. It is estimated that over 5,000 horsepower can be derived from the Little Muskegon waterpower. Contracts and franchises have been secured for the service in the towns listed above. The president of the new power company, Mr. George D. Westover of Cadillac, is manager of both the Cadillac Water and Light Company and the Osceola Light and Power Company. Mr. Thomas T. Bechtel, the vice-president, has been secretary and manager of the Grand Rapids Edison Company. The secretary and treasurer, Mr. E. A. Bending, is of the firm of Bending, Becknell & Co., engineers, and William F. Turner of Morley and Elroy B. Moore of Howard City are directors of the Little Muskegon Power Company.

TELEPHONE

The Aurora (Neb.) Electric Company has been incorporated with a capital stock of $35,000.

The People's Telephone Exchange of Duke, Okla., has been incorporated with a capital of $20,000.

The Golden Rod Telephone Company of Wahoo, Neb., has been incorporated with a capital stock of $100,000.

The Arlington (Okla.) Central Telephone Company has been incorporated with a capital stock of $10,000.

The Erie Railroad is to make a service test of a telephone system for dispatching trains on the division between Corry and Meadville, Pa.

PUBLICATIONS

The new catalogue of solderless cable joint fittings, issued by Dossert & Co., 242 West Forty-first Street, New York city, explains the advantages of these labor-saving devices and lists the various styles and sizes in which Dossert solderless connections may be obtained.

A little booklet of envelope size, entitled Dixon's Ticonderoga Flake Graphite" and published by the Joseph Dixon Crucible Company of Jersey City, N. J., describes the applications of this product to its uses as a lubricant. While quite brief, some interesting information is given on the pages. Copies will be sent by the manufacturer on request to those interested in machinery of any sort.

The Automatic Electric Company, Chicago, has had reprinted for distribution among telephone men the paper presented by Mr. W. Lee Campbell at the twenty-fifth annual convention of the American Institute of Electrical Engineers at Atlantic City, June 30, 1908, entitled "A Study of Multi-office Automatic Switchboard Telephone Systems," and will be pleased to send copies of this paper gratis upon request.

The Reynolds Electric Flasher Manufacturing Company has just issued a neat illustrated folder describing its new Reco flasher. The mechanism of this device, which is called the "king of the flashers" by its maker, is simple and will not get out of order. It is strongly made and will give a long life of service. Electrical dealers and contractors are asked to send for a copy of this little folder, which they will find interesting.

The "Freight Rate Primer" is a little booklet just published that shows the railroads' side of the controversy with the shippers relative to the proposed 10 per cent. increase in rates. It is shown that this increase would have an almost insignificant effect on the cost of commodities transported. Another and more formal booklet gives the correspondence on this subject between James T. Hoile, secretary of the Manufacturers' Association of New York, and William C. Brown, senior vice-president of the New York Central Lines, with newspaper clippings in relation thereto.

There has just been issued by the Belden Manufacturing Company, 194 Michigan Street, Chicago, its new No. 4 catalogue. It is a convenient pocket size, containing 124 pages, printed on fine paper, and profusely illustrated. Great pains have been taken to produce a simple and comprehensive book on wires, cables, cordage and other electrical raw material required particularly by users of wire. Each article listed is described and illustrated with half-tone cuts wherever possible, showing the construction and the manner in which it is prepared for shipment. A feature of special interest to electrical supply dealers is the putting up in paper cartons of such products as will permit, thus making an attractive and salable package and one that will keep the contents clean while on dealers' shelves. In the back of the book 25 pages are devoted to wire tables and formulas useful in the design of electromagnets, resistance coils, cables, etc. Copies will be sent free to those engaged in the electrical business on application to the company.

The Central Electric Company, Chicago, Ill., is distributing a number of new bulletins. One describes the P. A. electrically operated remote-control switch for use in controlling lights and power from a distance. This type of switch is particularly well adapted for use by engineers, contractors and architects in laying out a distribution system. The circular also contains wiring diagrams showing the complete wiring of both the main and auxiliary circuits. Bulletin No. 10 illustrates the OK fuse block cover for use by central stations in preventing theft of current. This block is manufactured to fit standard sizes of Edison plug fuse blocks, its use permitting all live parts of the block to be sealed, thus preventing tampering by unauthorized persons. It is particularly useful in connection with meter loops, where the service is liable to be tampered with. A new flyer describes type "B" oil switches for entrance and motor service. This switch has been designed to meet the demands for a small capacity, medium-price oil switch for use in connection with motor and lighting circuits up to and including 3,300 volts.

SOCIETIES AND SCHOOLS

At the meeting of the Electric Club of Chicago, held on August 19th, Mr. W. S. Taussig gave an interesting talk on "Entertainment as a Feature in Selling." The meeting of August 26th was addressed by Dr. C. D. Morrell of the Sheldon School on the subject "Salesmanship."

WIRELESS COMMUNICATION

The new portable wireless-telegraph kites, recently perfected for the army, have been given tests at Camp Stanley during the maneuvers of the regular army and the Oregon and Washington National Guards. Messages were picked up from a number of wireless stations on Puget Sound.

Lieutenants Colin, Jeance and Mercier, of the French navy, the inventors of wireless telephone apparatus, are reported to have succeeded in communicating with the wireless station at Baz de Sein, Department of Finistere, at a distance of about 310 miles. Lieutenant Colin, the chief inventor, installed the wireless station in the Eiffel Tower. He is now superintending the installation of an improved power plant expected to make possible the dispatch of messages between Paris and New York.

MISCELLANEOUS

English is destined to become the universal language of the world in the opinion of A. C. Meyer, member of the lower house of the Danish Parliament, who addressed Chicago Scandinavians recently. "We non-English speaking Europeans might as well recognize the fact that English is destined to become the universal language of the world," said the speaker. "Already European workingmen on the Continent and in the Scandinavian nations are learning English. Many English words, such as strike, lockout, boycott and other terms of industrial origin are common in most European tongues. The English language will continue to spread until it is spoken by every nation and tribe in the world."

An interesting investigation, reported in electricity, has recently been started at the Manchester University kite station at Glossop, the object being to determine the electrical conditions of the upper atmosphere. It has long been well known that the air at some distance above the ground level is at a relatively high potential. In these experiments a kite is sent up attached to a steel wire, which is anchored down to the ground by means of an insulator. The potential difference is first determined, and then the wire is connected to earth through a galvanometer, which measures the current. Some experiments carried out recently on these lines showed that the potential at 1,200 feet above the ground was over 100,000 volts. The current flowing down the wire when the kite was at this height was about forty-millionths of an ampere.

TRADE NEWS

The Auckland (New Zealand) harbor board calls for tenders for the supply of 16 electric cranes. Tenders should be submitted by October 1st to Messrs. W. & A. McArthur, Ltd., 18 to 19 Silk Street, London, E. C., England, from whom also specifications and diagrams may be procured.

Sealed proposals will be received at the office of the supervising architect, Washington, D. C., until September 29, 1908, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States postoffice and custom house at Bridgeton, N. J., in accordance with drawings and specification, copies of which may be obtained from the custodian of the site or at the above office.

The Board of Public Works of Logansport, Ind., will receive bids on the equipment for its electric-light plant, to consist of a 500-kilowatt alternator, and a 150-kilowatt alternator, with exciter set, switchboard, street lamps and condenser. Copies of specifications may be obtained from the consulting engineer, J. Walter Esterline, Lafayette, Ind. Bids will be opened September 2d. The right is reserved to refuse any or all bids.

Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until October 5th for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States postoffice at Chippewa Falls, Wis., in accordance with drawings and specification, copies of which may be had at the above office or at the office of the custodian of the site at Chippewa Falls.

Sealed proposals for furnishing and installing an alternating-current generator and turbine water-wheel unit, switchboards, transformers and wiring electrical apparatus, are invited by the Sanitary District of Chicago and will be received by its clerk at Room 1500, American Trust Building, Chicago, until Wednesday, September 24th. All proposals must be made upon blank forms furnished by the Sanitary District and in accordance with the plans, specifications and contract form on file in the office of the District's electrical engineer at the address given.

BUSINESS

At the convention of the Municipal Electricians at Detroit last week the exhibits of the Safety Insulated Wire and Cable Company and the M. B. Austin Company, Chicago, were in charge of Messrs. A. H. Friend, R. J. Thorne and R. C. Smith.

In the illustrated description that appeared on page 104 of the Western Electrician of August 8th of the flaming arc and the semi-enclosed arc lamps made by the Stave Electrical Company of New York city, an error was made in calling these lamps "Stavelco" arc lamps. The fact is that this name is applied only to the semi-enclosed miniature arc lamp, and the other lamps are known as "Stave" arc lamps. Among many recent orders for Stave flaming arc lamps was one for eight units for the Buckeye Engine Company, Salem, Ohio.

The Pittsburg Transformer Company announces its new silico-vanadium steel and the completion of its final designs based upon the characteristics of the new alloy. Silico-vanadium steel, as indicated by its descriptive name, is an alloy steel, possessing magnetic and physical properties radically different from the acid open-hearth low-carbon steels hitherto employed in transformer cores. The manufacturer announces that core losses in its transformers have thus been reduced 30 to 50 per cent. and improved copper losses and regulation are also secured. For example, the core loss in the five-kilowatt type is now less than 50 watts. Other information and price lists may be secured by addressing the company at Pittsburg, Pa.

The Virginia and Mexico Mining and Smelter Corporation of Hostotipaquillo, Jalisco, is having shipped from the Westinghouse Electric and Manufacturing Company of Pittsburg, Pa., a number of electric motors to be used in connection with its new mill. There will be some 15 motors, totaling over 300 horsepower, the majority of which will be used for belt drive. There is to be a 30-stamp mill, each 15 stamps being driven by a separate 30-horsepower motor. A 20-horsepower motor will drive two Wifley concentrating tables. One 30-horsepower motor will be used to drive three crushers, and a second similar motor will operate an air compressor, mechanical agitator and vacuum pump. These last are for use in connection with the slime agitation and the Butters filter press which is to be installed. Another 30-horsepower motor will be used to drive three solution pumps and three Frenier pumps. A 10-horsepower motor will operate a Robins belt conveyor for handling the sands, etc. The mill is to be one of the most modern in Mexico, and the extraction obtainable will be correspondingly high, partly due to the modern machinery, and partly on account of the better efficiency obtained by the use of individual-motor drives on the separate machines. Mr. Jesse Scobey is manager of the property.

DATES AHEAD

Association of Edison Illuminating Companies (annual convention), Hotel Aspinwall, Lenox, Mass., September 15th, 16th and 17th.

Old Time Telegraphers' Association and Society of the United States Military Telegraph Corps (annual reunion), Cataract-International Hotel, September 16th to 18th.

Colorado Electric Light, Power and Railway Association (annual convention), Glenwood Springs, Colo., September 16th, 17th and 18th.

Arkansas Association of Public Utilities Operators (first annual convention), Little Rock, Ark., September 17th and 18th.

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

American Electrochemical Society (fall meeting), New York city, October 30th and 31st.

Association of Car Lighting Engineers (first annual convention), Chicago, November 16th to 21st.

Chicago Electrical Show (fourth annual), Coliseum, January 11th to 23d, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) August 18, 1908

896,081. Telephone Call Register. Byron B. Brockway, Cleveland, Ohio, assignor to the Dean Electric Company, Elyria, Ohio. Application filed March 30, 1906.

The call register is located on the transmitter shell and presents a visible record to the subscriber, but is actuated by the operator. When so actuated a sound produced in the register is transmitted through the diaphragm back to the central office informing the operator that the record has been completed.

896,092. Elastic Suspension for the Filaments of Electric Incandescent Lamps. Paul Druseidt, Remscheid, Germany. Application filed April 16, 1908.

The filament is carried on a support which is entirely suspended by coiled springs attached from the ends and sides of the lamp globe. (See cut on next page.)

896,103. Telephone System. Charles L. Goodrum, Philadelphia, Pa., assignor to the Dean Electric Company, Elyria, Ohio. Application filed July 31, 1903.

The cord circuit involves the use of two opposed sections of battery (6 volts and 34 volts), and two polarized supervisory relays. The line circuit contains only a line relay, besides a pair of retard coils. The jacks have three contacts, two of which are short-circuited by the sleeve of the plug.

896,120. Electrically Operated Valve. Christian Krämer, Frankfort-on-the-Main, Germany, assignor to Felten & Guilleaume-Lahmeyerwerke Actien-Gesellschaft, Frankfort-on-the-Main, Germany. Application filed May 2, 1906.

The valve stems are loosely connected to the armature of an electromagnet.

896,130. Receiver for Wireless Telegraphy. Guglielmo Marconi, London, England, assignor to the Marconi Wireless Telegraph Company of America, New York, N. Y. Application filed March 13, 1907.

The arrangement of the oscillatory circuit, the oscillation valve, an induction coil and a condenser is shown in the circuit diagram. (See cut on next page.)

896,144. Electrode. Harry Pauling, Gelsenkirchen, Germany, assignor to the firm of Salpetersäure-Industrie-Gesellschaft, G. M. B. H., Gelsenkirchen, Germany. Application filed August 13, 1906.

The electrodes are for use in a process for the treatment of air or gases by arc discharges, which consists in producing melted metal oxides at the points of the electrodes made of a metal generating the oxides by the action of the electrical energy.

896,173. Telephone Apparatus. James H. Thompson, Trenton, N. J. Application filed December 30, 1907.

The telephone set is fitted with a box containing a retractile reel to coil up the extra cord.

896,184. Apparatus for the Electrolysis of Fluids. Emil Weichert, Augsburg, Germany. Application filed October 24, 1906. Renewed May 11, 1908.

The electrolyte is contained in a coil of tubing which has chambers holding the electrodes at the top of each turn. The coil is immersed in a cooling bath.

896,188. System of Storage-battery Control. Edward Wray, Janesville, Wis. Application filed November 20, 1906.

A resistance switch-arm is held by a magnetic latch whose release is actuated by a motor closing a contact through a train of gears.

896,189. Electric Trolley. John Young, Toledo, Ohio. Application filed April 29, 1908.

The trolley wheel is a hollow ring whose inner bearing surface is carried on rollers. The wheel is enclosed in an eccentric metallic case containing a chamber for a lubricant in contact with the rollers.

896,192. Terminal Piece for Electric Circuit-breakers. Christian Aalborg, Wilkinsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, Pittsburg, Pa. Application filed May 2, 1906.

A tubular terminal piece has an inwardly tapered open end and is made up of a number of cylinders of sheet metal having radial cuts extending longitudinally.

896,198. Trolley Pole. Lawrence C. Collins and Arthur R. Eltom, Cranford, N. J. Application filed February 28, 1908.

The pole is arranged with telescope members and springs, so that when the trolley wheel leaves the wire its re-engagement is automatically effected.

896,200. Branch Connection for Electric Cables. John J. Dossert, New York, N. Y., assignor to Dossert & Co. Application filed March 7, 1904.

A branch fitting is described.

896,210. Contact Member. Henry D. James, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company. Application filed May 16, 1906.

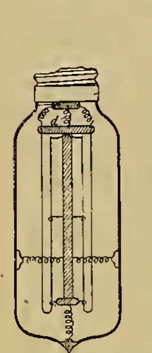
One contact member has a frusto-conical outer surface, a cylindrical end recess, and a plug projecting from the center of the recess. The co-operating member has a yielding plug, the end of which engages the other plug.

896,216. Electrically Propelled Vehicle. Louis Krieger, Paris, France. Application filed January 10, 1906.

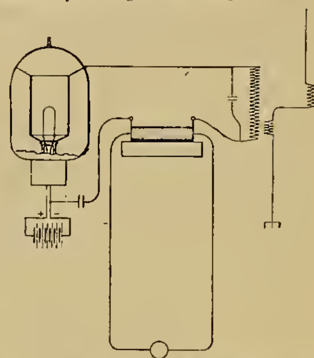
In combination with a generator of constant power is a motor driven by it and having an independent demagnetizing winding in parallel with the armature and field windings. (See cut.)

896,217. Winding for Single-phase Induction Motors. Fred R. Kunkel, Edgewood Park, Pa., assignor to the Westinghouse Electric and Manufacturing Company. Application filed December 3, 1906.

The auxiliary winding comprises groups of coils, which are systematically arranged with respect to the



No. 896,092.—FILAMENT SUSPENSION



No. 896,130.—WIRELESS TELEGRAPH RECEIVER

main-winding sections, and are connected in series with each other and in parallel with one of the coils of the main winding when the latter are in series.

896,218. Electric Welding Machine. Laurence S. Lachman, New York, N. Y. Application filed August 6, 1906. Renewed November 22, 1907.

The two electrodes, which may be forced together, have plane faces, in the center of which are low, wide protuberances.

896,220. Electric Locomotive. Benjamin G. Lamme and Norman W. Storer, Pittsburg, Pa., assignors to the Westinghouse Electric and Manufacturing Company. Application filed January 5, 1907.

The motor is resiliently geared to the axle and mounted so that the vertical component of the reaction of the torque opposes the action of gravity upon the motor equally for both directions of rotation.

896,222. Electrical Measuring Instrument. Paul MacGahan, Wilkinsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company. Application filed November 23, 1906.

The current in the instrument circuit, which is proportional to that in the supply circuit, is arranged to be periodically opened.

896,225. Means for Automatically Restoring a Trolley Wheel to the Wire. Charles F. Mehl, Cleveland, Ohio. Application filed September 18, 1907.

An auxiliary electrically controlled trolley wheel is supplied, which springs into position on the wire in case the main wheel should leave the conductor.

896,227. Means for Regulating the Supply of Electric Currents. Charles M. P. Montbarron, Paris, France. Application filed April 18, 1907.

One terminal of the generator armature is grounded, and a contact device connected to the other terminal is arranged to make traveling contact with the plates of a ring alternately made up of grounded plates.

896,243. Gas or Vapor Electric Apparatus. Max von Recklinghausen, New York, N. Y., assignor to the Cooper Hewitt Electric Company. Application filed February 20, 1903. Renewed February 19, 1907.

A starting device for mercury-vapor lamps; the arc is drawn within the tube by a metal bridge carried on a long shank, which extends up through a vertical tube of mercury of barometric height and is controlled at its free end by a solenoid. (See cut.)

896,249. Electric-motor Control. Girard B. Rosenblatt, Butte, Mont., assignor to the Westinghouse Electric and Manufacturing Company. Application filed December 27, 1906.

With the asynchronous motor and its friction brake is combined an air cylinder whose piston is connected to the brake for regulating the braking action.

896,274. Arc Lamp. Guy N. Chamberlin, Lynn, Mass., assignor to the General Electric Company. Application filed December 21, 1906.

After the electrodes have been consumed to a predetermined amount, the quantity of air admitted to the arc is regulated by the feeding movement of the carbons.

896,297. Electric Heater. Edward M. Hewlett, Schenectady, N. Y., assignor to the General Electric Company. Application filed April 27, 1907.

Grid-shaped resistance strips extend outward from a central support of the heater.

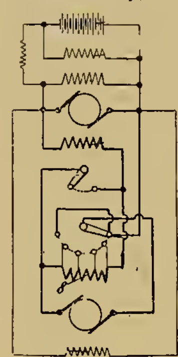
896,300. Electrical Testing Instrument. Cameron De Witt Jarvis, Winthrop, Mass., assignor to the American Telephone and Telegraph Company. Application filed June 19, 1907.

An incandescent lamp is fitted with grip-jaw contacts. The lamp is arranged with a parallel resistance so that the current through the filament can be regulated.

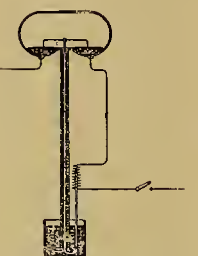
896,319. Current Collector for Electric Railways. Philipp Pforr, Lankwitz, near Berlin, and Paul E. Herkner, Berlin, Germany, assignors to the General Electric Company. Application filed January 23, 1907.

The current collector, which is raised by fluid pressure, has an automatic arrangement of cylinders for throttling the fluid supply during the raising process, while allowing the collector to descend rapidly.

896,321. Field-magnet Structure. Henry G. Reist, Schenectady, N. Y., assignor to the General



No. 896,216.—MOTOR CONTROL



No. 896,243.—MERCURY-ARC STARTER

Electric Company. Application filed April 16, 1902. Renewed June 12, 1905.

The magnet structure is made up of alternate large and small polygonal laminated units riveted together.

896,322. Dynamo-electric Machine. Henry G. Reist, Schenectady, N. Y., assignor to the General Electric Company. Application filed July 10, 1903.

The laminated pole pieces have spaces formed in their tips extending transversely to their faces, through which supports pass to retain the field coils in position.

896,323. Dynamo-electric Machine. Henry G. Reist, Schenectady, N. Y., assignor to the General Electric Company. Application filed July 10, 1903.

Details of the construction of the field-magnet structure are described.

896,332. Automatic Train Stop. Hiram G. Sedgwick, Mill Valley, Cal. Application filed August 4, 1906.

A magnet mounted on the roadbed acts upon an armature suspended by springs from one of the cars of the train. When deflected or dragged backward by the track magnet the train armature, through either electromagnetic or pneumatic means, operates a train-stop mechanism.

896,341. Filament for Incandescent Lamps. Willis R. Whitney, Schenectady, N. Y., assignor to the General Electric Company. Application filed November 14, 1904.

The filament is formed of nitride of cerium.

896,348. Cigar Lighter. Eskil Berg, Schenectady, N. Y., assignor to the General Electric Company. Application filed April 26, 1907.

The lighter is fitted with a standard screw-contact base and contains an electric-heating coil, which may be reached by the cigar end through a hole in a refractory shield.

896,350. Storage-battery Element. John Bimeler, Zoar, Ohio, assignor of one-tenth to the Zoar Battery Company. Application filed February 13, 1908.

Leaves of active material are arranged in the openwork frames of the grid.

896,397. Pencil and Apparatus for Producing the Arc Light. Isador Ladoff, Cleveland, Ohio, assignor of 30 one-hundredths to Philip C. Peck, New York, N. Y. Application filed September 23, 1907.

The electrodes are composed of an alloy of copper and titanium.

896,416. Telegraphone. Hermann Schütte, Wheeling, W. Va. Application filed October 10, 1907.

A continuously rotating steel disc is controlled to give a constant linear speed past a magnet, which is movable radially to the disc.

896,417. Arc Lamp. Ralph Scott, Wilkesbarre, Pa., assignor to the Scott Electrical Company. Application filed June 1, 1905.

The feed-clutch mechanism, which is actuated by a novel arrangement of magnet poles, is described.

896,429. Electrode for Electric Furnaces. Frederick M. Becket, Niagara Falls, N. Y., assignor to Winthrop Chanler. Application filed November 24, 1902. Renewed December 22, 1906.

The electrode has a hollow body of ferro-titanium alloy, on which is a shell of carbon.

896,463. Fireproof Support for Electrical Wires in Railway Cars. Edward T. Robinson, St. Louis, Mo., assignor to the St. Louis Car Company. Application filed February 11, 1908.

A fireproof conduit is arranged for installation at the inside angle of the roof.

896,516. Motor-control System. Herbert W. Cheney, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed July 12, 1906.

A single starting controller is arranged to start a number of electric motors in succession.

896,554. Heater. Anna I. D. Kyle, Aberdeen, S. D. Application filed April 14, 1908.

Motor-driven fans are arranged to propel air past electric heating coils.

896,555. Electrolytic Cell. Gilbert C. Landis, York, Pa. Application filed September 17, 1907.

A number of electrode plates in the container cause the liquid electrolyte to take a circuitous path.

896,584. Electrical Apparatus for Transmitting Signals. Charles Salmon and Henry J. Creffield, Erith, England, assignors to Vickers Sons & Maxim, Limited, Westminster, England. Application filed October 23, 1906.

Counting devices are inserted in the receiving and transmitting ends of the electric circuit.

896,586. Make-and-break Device. Dominic Sandretto, Ladd, Ill. Application filed June 22, 1908.

An electromagnet drives a step-by-step ratchet mechanism.

896,608. Arrangement of the Winding of Electromagnetic Clutches. Heinrich Ast, Vienna, Austria-Hungary, assignor to the firm of Vulkan Maschinenfabriks - Actien - Gesellschaft, Vienna, Austria-Hungary. Application filed June 15, 1906.

The winding is contained in an annular channel.

896,617. Telephone-switchboard Apparatus. Lewis A. Brinkman, Chicago, Ill., assignor to the Kellogg Switchboard and Supply Company. Application filed February 8, 1904.

Details of operator's keyboard construction are described.

896,630. Electrical Heating Means for Molds. Harry E. Diller, Oak Park, Ill. Application filed January 14, 1907.

A primary winding surrounds one of the risers in the mold, so that as the metal in the mold cools and shrinks additional hot metal from the riser may flow into the mold.

896,698. Arc Lamp. Charles P. Steinmetz and John T. H. Dempster, Schenectady, N. Y., assignors to the General Electric Company. Application filed November 16, 1903.

The feed motion is produced by gravity controlled by electromagnetic stops, allowing only a predetermined advance of the carbons.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired August 25, 1908:

458,162. Electric Motor. L. Gutmann, Fort Wayne, Ind.
458,163. Alternating Electric-current Heater. L. Gutmann, Pittsburg, Pa.
458,164. Method of Operating Alternating Electric Motors. L. Gutmann, Pittsburg, Pa.
458,176. Art of Electric Welding. H. Lemp, Lynn, Mass.
458,177. Adjustable Electric Clamp. H. Lemp, Lynn, Mass.
458,178. Electric Alarm Clock. C. Lester, Chicago, Ill.
458,184. Electric Coal-mining Machine. E. C. Morgan, Chicago, Ill.
458,188. Electric Clamp. E. Rasmussen, Lynn, Mass.
458,206. Electric Alarm Clock. L. Winterhalder, Brooklyn, N. Y.
458,236. Armature for Dynamo-electric Machines. L. A. McCarthy, Brooklyn, N. Y.
458,242. Electric Lamp Socket. H. E. Swift, Boston, Mass.
458,258. Spring Jack Commutator for Telephone Switchboards. L. A. Berthon, Paris, France.
458,278. Electric Stop Mechanism. E. Boening, Yonkers, N. Y.
458,279. Portable Electric Lamp. L. Bristol, Bromley, England.
458,327. Electric Alarm Clock. J. O. Newton, New Haven, Conn.
458,376. Arc-lamp Electrode. W. S. Richards, Natick, Mass.
458,377. System of Electrical Propulsion for Vehicles. W. S. Richards, Natick, Mass.
458,386 and 458,387. Electric Arc Lamp. N. M. Garland, New York, N. Y.
458,388 and 458,389. Electric Arc Lamps. N. M. Garland, New York, N. Y.
458,424 and 458,425. Secondary Battery. O. Lugo, New York, N. Y.
458,479. Telephone. E. Noriega, Mexico, Mexico.
458,489. Electric Signal and Switch-moving Mechanism. J. Ramsey, Jr., Ed. W. Harden and C. M. Wilder, Cincinnati, Ohio.
458,500. Electric Arc Lamp. H. W. Sander, St. Louis, Mo.
458,545. Electric Motor. C. E. Egan, Columbus, Ohio.

WESTERN ELECTRICIAN
EVERY SATURDAY
Vol. XLIII. CHICAGO, SEPTEMBER 5, 1908 No. 10

A 2,000-VOLT DIRECT-CURRENT FREIGHT RAILWAY

By Dr. Alfred Gradenwitz

An interesting electric railway for heavy traction has been recently installed at the Moselhütte blast-furnace plant of Maizières, Lorraine, which belongs to the Rombach Metallurgical Works. This railway, a description of which is given in the following, will be found remarkable both because of its performance and of the use of high-potential direct current.

The blast-furnace plant in question is connected with the Sainte Marie iron mine (whence about 2,600 tons of iron ore are derived daily) by a single track, narrow-gauge railway, 14 kilometers in length. The profile of the track, as shown on the next page (Fig. 4), puts the rolling stock to exceptional strain, owing to the grades. In fact, grades of up to three per cent. have to be negotiated by trains both with and without load.

Two trains passing each other at a turnout situated at five kilometers from the mine are required to haul the output of the mine, which had so far been done by means of steam locomotives. Each single run, owing to irregularities and delays due to the heavy gradients, will last about two hours. The ore cars are partly double-axle hopper cars, three tons in weight and eight tons in capacity, while self-dumping cars, 12 tons in weight and 30 tons in capacity, with air brakes and pneumatic discharge, are being substituted for them. The weight of each train varies between 200 and 300 tons, according to its composition.

The steam locomotives had been taxed in this installation to the utmost of their capacity, and when the output was to be increased to about 4,000 tons daily, the substitution of electric locomotives for steam locomotives was considered, the more so as the remainder of the ore mines of the Rombach works had been electrified throughout, electric energy being produced both at Moselhütte and at the Ste. Marie Mine in the form of 5,700-volt polyphase current.

It may be said that the task of conveying trains 200 to 300 tons in weight across so heavy gradients with an economical current distribution was by no means an easy one, the main difficulties being due to the narrowness of the gauge (one meter), which necessarily exerted its influence on the design of the locomotives and their motors, as well as on the adoption of a suitable current system, the track having to be fed only from the terminals, where electric power stations already existed. Owing to the considerable length of the line, direct current at 800 volts, as used at the Rombach Metallurgical Works in connection with locomotives serving the remaining mines, had to be excluded from the outset. The immediate use of the existing polyphase current, on the other hand, was inadmissible, because of the necessity of a double or triple overhead trolley line. High-potential direct current or single-phase alternating current had therefore to be adopted, and the two schemes offered for competition were relative to these two systems. Both provided for sub-stations to be erected at either end of the line, the direct-current tension between the overhead conductor and the ground being 2,000 volts, and the single-phase current tension 6,000 volts. The rails were to be used as return in both cases.

FIG. 1. SINGLE-TRACK LINE CONSTRUCTION

When comparing the essential part of both schemes, i. e., the motive power, and considering the permissible dimensions in the construction of each kind of motor, it was found that, owing to differences in the characteristics of each of the two motors, the maximum output to be reached on so narrow a gauge was found in the case of the direct-current motor. In fact, the latter had an output of 160 horsepower, while only 60 horsepower was computed as the output of the alternating-current motor. The consequences of this superiority of direct-current motors over single-phase motors were very far-reaching. Whereas four driving axles were required in the case of direct-current locomotives, to insure the output desired, six driving axles had to be arranged on the single-phase locomotives, though the output of four direct-current motors could not be reached even by six single-phase motors. The direct-current scheme, therefore, had the advantage over its competitor, both because of the output of locomotives and the simplicity of design of the latter, which was the more important in the case of a mining railway, that obviously has to dispense with any expensive supervision. Single-phase current, on the other hand, was superior to direct current because of the more economical current distribution, while the disturbances of signaling and telephone circuits resulting from stray currents in the case of the single-phase current scheme were decided disadvantages of the latter. The direct-current system was therefore given the preference, the Siemens-Schuckert Works of Berlin being intrusted with the construction of the electrical machinery and the equipment of the line.

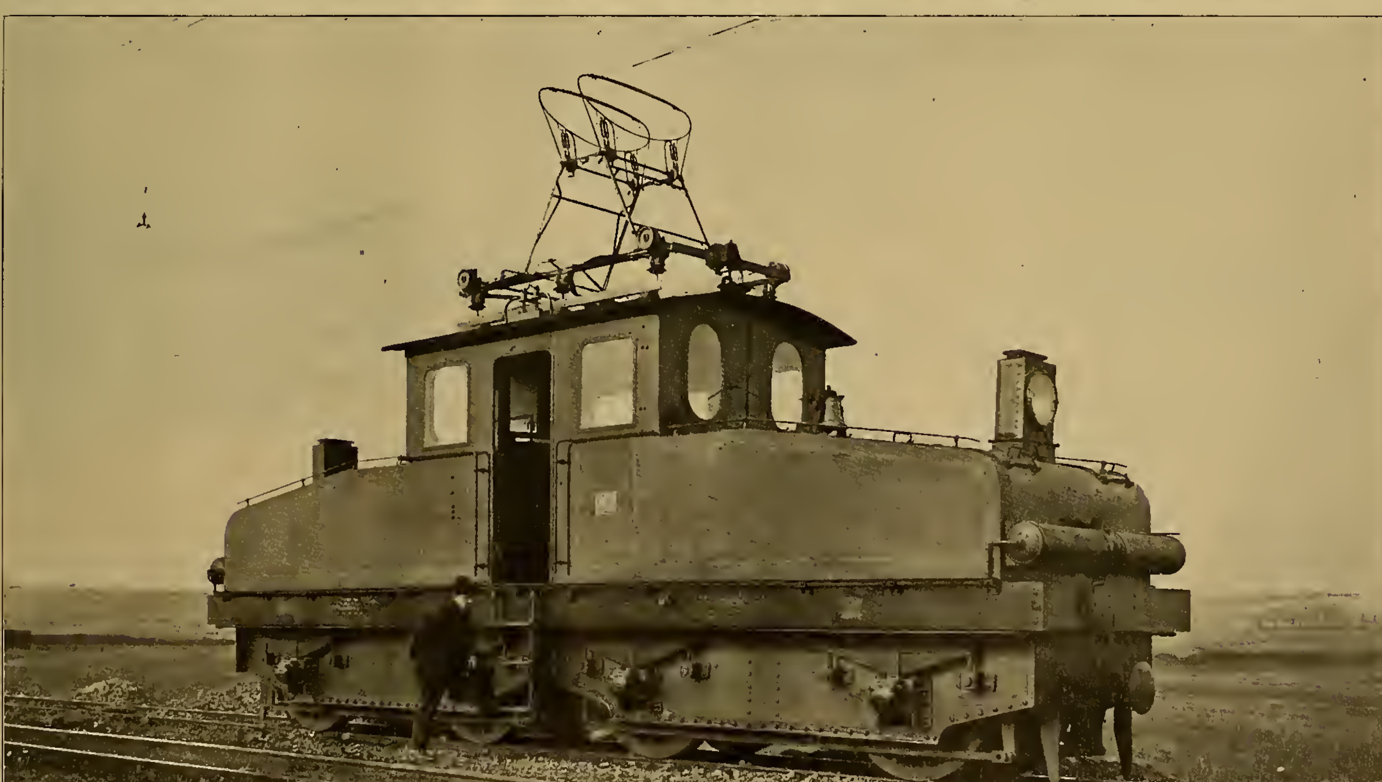


FIG. 2. LOCOMOTIVE FOR 2,000-VOLT DIRECT CURRENT FREIGHT RAILWAY

Motor-generator Stations

The 2,000-volt direct current is supplied by two motor-generator sets, installed at the Moselhütte and Ste. Marie power stations, respectively. Each of these sets, as shown partly in Fig. 3, is made up of four machines, a three-phase synchronous motor with its starting motor, a direct-current generator and an exciter supplying the exciting current for both the generator and the synchronous motor. All these machines are mounted on a common shaft carried by only two bearings. The three-phase current, supplied at a tension of 5,700 volts, is used directly in the synchronous motor and in the starting motor after being stepped down to 500 volts. The synchronous motor, running at 375 revolutions per minute, has an output of 880 horsepower and the direct-current generator a capacity of 600 kilowatts at 2,000 volts. The exciting potential is 65 volts. Special care was bestowed on the insulation of the direct-current dynamo commutator, the pressure of 2,000 volts being generated without any special insulation of the frame or armature. As seen in the illustration, the positive brushes are separated from the negative brushes by a radial system of insulating plates. The arms of the brush-holders are fixed to, and insulated from, a common rotary ring, which in turn is insulated from the frame of the machine. These measures of precaution have been found quite sufficient to prevent any arcing.

The switching plant, comprising two marble switchboards and several high-tension apparatus panels, contains all such apparatus as is required to operate the set. Both the synchronous motor and the direct-current generator are protected by automatic overload circuit-breakers. From the sub-stations, the current is conveyed by feeders running on insulators to the overhead conductor, while the negative side, being grounded immediately behind the board, is connected to the rails by means of a bare conductor laid in the ground near the building.

Overhead Conductors

The overhead conductors, as seen in Figs. 1 and 7, comprise two wires 55 square millimeters in cross-section each, which are mounted beside one another at 130 millimeters distance, in a pendulating suspension, so as to insure the simultaneous contact of both wires with the trolley. These suspensions themselves are suspended from a steel supporting wire carried by insulators fixed to brackets. The trolley wires are protected against lateral displacement by transversal wires inside of the brackets. The transversal wires are likewise fixed to porcelain insulators.

Existing poles along the railway track, which carry on the top the high-tension conductors supplying the mine with current from the metallurgical works, were used as poles for these brackets. Special feeders were not provided, the copper cross-section of the overhead wires (a total of

pair being permanently connected in series. Therefore the motors are wound for a tension of 1,000 volts, although their insulation has been designed for considerably higher voltages. The motor armature comprises 61 slots, each of which contains 12 flat copper conductors. On the commutator, the diameter of which is specially large, and which is made up of 183 segments, two brush sets bear, each of which comprises three carbon brushes. In order to avoid sparking during commutation, which is of special importance in the case of such high tensions, the motors are provided with commutating poles traversed by the main current. In order to insure additional safety, the space surrounding the commutator has been filled in completely with insulating material. The design of

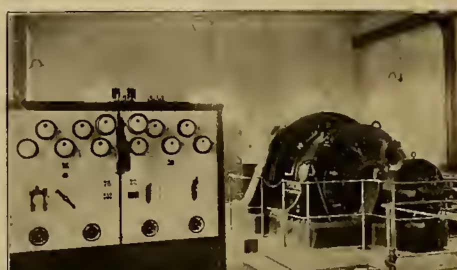


Fig. 3. Motor-generator Set and Switchboard Therefor
A 2,000-VOLT DIRECT-CURRENT FREIGHT RAILWAY

the motor otherwise resembles that of ordinary Siemens-Schuckert narrow-gauge traction motors. Figs. 5 and 6 show the internal design of the motor.

The controller occupies the center of the very spacious motorman's cab. It follows in general design the controllers used on tramways, consisting of a main switching drum for inserting resistances and changing the motor groups from series to parallel, a reversing switch for altering the direction of running and a motor cut-out switch for switching any of the motors out of circuit in case of damage to it. However, the dimensions of the controller, owing to the devices provided for extinguishing arcs and to the greater length of air gaps (as resulting from a tension of 2,000 volts), had obviously to be made far more considerable. The controller was therefore arranged horizontally, as seen in Fig. 8. The segments on which the con-

upward in the shape of a lever. The current is broken in its central position, the main handles being locked mechanically.

The two compartments reserved for the different apparatus and the resistances at the ends of the motorman's cab, are accessible from the top through large bulkheads. On one side are the starting resistance coils, supported by means of porcelain insulators on iron frames. The latter are once more insulated by special bearing insulators.

The series-current circuit of the locomotive further comprises an automatic overload circuit-breaker and a safety fuse, the former being installed in the motorman's cab and being surrounded by a closed protective cabinet. Oil switches, otherwise used in connection with high tension and which have the advantage of small space requirements, could not be used here, because of the excessive tension generated by the sudden extinguishing of arcs in oil, in the case of high-potential direct current. Experiments made on direct-current tensions of 3,000 volts have shown these excesses in tension to be the more considerable as the interruption is more abrupt. They are therefore strongest in the case of oil interruption, less strong in the case of blow-out magnets, and lowest in the case of horn-extinguishing. The circuit-breakers used have, on the other hand, been found excellent, even with higher direct-current tensions and the very greatest current intensities, the arc being produced between the movable carbon-armed contact levers and the stationary copper springs and having double interruption. The flame rises between substantial asbestos-slate plates. The safety fuse is located on the roof of the locomotive and comprises a pair of horns extinguishing the electric arc in an upward direction. A lightning arrester with its inductive coil is also provided.

The connections to the two motor compressors supplying the required compressed air, are tapped off immediately behind the inductive coil. The compressors are located in one of the apparatus compartments on cast-iron ballast blocks. Two three-horsepower, 1,000-volt series motors drive the compressors. The direct coupling of the motors to the air pumps at the high speed of about 1,000 revolutions per minute is especially remarkable, and was rendered possible by a special design of the pump valves. In fact, the piston in its lowermost position disengages a number of apertures at the circumference of the cylinder through which the air is allowed to enter. On the piston rising, the apertures then are locked and the air is com-

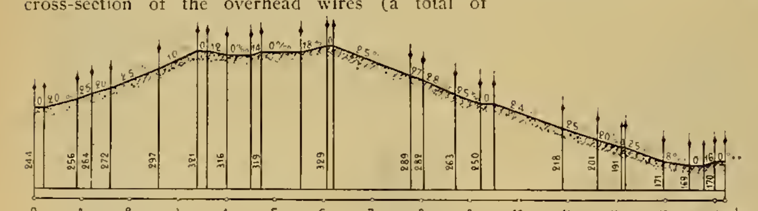


Fig. 4. Profile of Line, Showing Grades in Tenths of One Per Cent

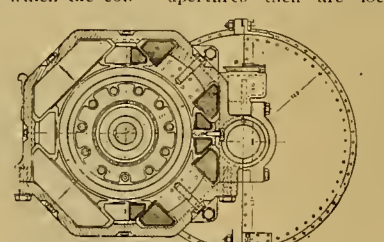


Fig. 5. Cross Section Through Driving Motor

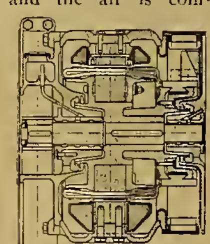


Fig. 6. Longitudinal Section Through Motor

A 2,000-VOLT DIRECT-CURRENT FREIGHT RAILWAY

110 square millimeters) being quite sufficient to supply current to the line fed by the sub-station from either end. The drop in tension on the locomotives was found to remain within quite admissible limits.

Locomotives

The locomotives, three of which have been so far constructed, as seen in Fig. 2, have wrought-iron trucks and four axles. The main dimensions are as follows:

Length across buffers, 10 meters.
Width of locomotive, 2.2 meters.
Height of locomotive (without current collector), 3.850 meters.
Diameter of running wheels, 1.250 meters.
Weight of locomotive, 55 tons.

The trucks are connected to the body of the locomotive by a substantial trunnion, supporting it on two sliding pieces arranged on both sides of the trunnion. The central buffers and the couplers are attached to the trucks. The plates of the trucks and the body are of specially substantial design, with a view to imparting as great as possible a part of the required weight to the construction itself, only a small amount, about nine tons, being cast-iron ballast.

Each of the four axles is driven by a 160-horsepower motor through gearing, the motors in each

tact fingers slide, are clear of all the neighboring parts, being separated from the latter by air gaps of ample dimensions and supported by grooved insulators mounted on the main controller shaft. Between each two sliding contacts there is fitted an arc-extinguishing coil. All these coils are connected in series and are excited by the full amount of current taken by the locomotive. The arcs which are always blown upward by the blow-out coils, will be put out almost instantaneously with the assistance of the horn-shaped contact fingers that have been provided.

Below the main drum there is the reversing switch separated by insulating plates from the upper compartment. Here there is also the motor cut-out switch, which allows each motor to be switched off separately, so that three motors can be used to continue operation in the case of a breakdown to the fourth. The segments of these two switches are mounted directly on the insulating material of the latter, and as these switches can be actuated only when the main controller cylinder is switched off, the blow-out coils are dispensed with. The locking device is arranged in the front part of the controller, and all handles for operating the switches are insulated from the latter. The main switching cylinder terminates in front in a big steering wheel, while the handle of the reversing switch is carried

pressed in the upper compartment, escaping into the pressure pipe through a narrow annular slot covered by a membrane only one-tenth of a millimeter in thickness, which constitutes the valve. This extremely light membrane follows the operation of the piston very easily.

A switchboard, located in the apparatus compartment, serves to control the current distribution for the compressor motors and the lights. The fuses used in this connection had to be given a special design on account of the high voltage. The short-circuit energy is accordingly distributed over a length of fuse band as considerable as possible, while a destruction of the latter is prevented by an elastic cover. This type of fuse consists of a helicoidal fuse wire about 60 centimeters in length.

The lighting of the locomotives comprises two headlights at the ends, each arranged with seven incandescent lamps in a large reflector, as well as two incandescent lamps for lighting the apparatus of the motorman's stand. The lamps are arranged in sets of eight in series with a potential of 250 volts each.

The motorman's stand comprises on a marble panel a pressure gauge for the brakes, two ammeters for the two groups of locomotive motors and a speed gauge, consisting of a voltmeter, the deflections of which are proportional to the speed

Fig. 7. Double-track Line Construction

A 2,000-VOLT DIRECT-CURRENT FREIGHT RAILWAY

of rotation of a small magneto-electric machine driven from one of the wheel axles.

A short-circuiting device, that is to say, a switch directly grounding the current collectors, has been arranged in the cab, to protect against the risk of the current collectors being suddenly thrown upward toward the overhead wires.

The brakes of the locomotive comprise a Westinghouse air brake and a spindle-operated hand brake. Four tanks of 60 liters capacity each, mounted outside on the ends of the locomotive, are used as main air reservoirs. A terminal braking valve, allowing the effect of the brake to be gradually altered, and which is of especial advantage on extensive gradients, is connected to the main braking valve. Special small air reservoirs are used both for the whistle and sander. Behind the pumps there is another continuous main pipe

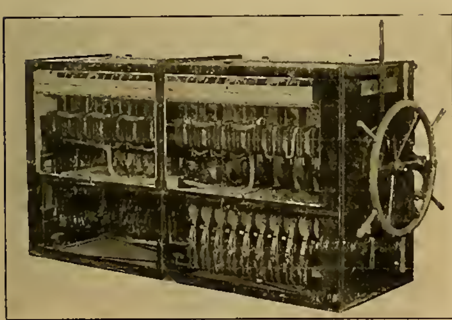


Fig. 8. Main Controller

A 2,000-VOLT DIRECT-CURRENT FREIGHT RAILWAY

connected to two special air reservoirs, which supply any compressed air required for the automatic dumping of cars.

The writer is indebted for the particulars contained in this article, as well as for the photographs herewith reproduced, to the managers of the Siemens-Schuckert Works.

SEARCHLIGHT IN ANIMAL CAPTURE

As an experiment in the use of the electric searchlight in the capture of wild animals, and especially in the recapture of the escaped denizens of zoological gardens, two gray wolves were liberated at the Bronx Park Zoo last week. Raymond L. Ditmars, curator of the zoological exhibit, assisted by 16 keepers, had no trouble in recapturing the wolves with the aid of the searchlight, which was used for the first time. The experiment was so successful that the searchlight will be kept in readiness hereafter to aid in trapping escaped animals. The wolves, which had been released in the park surrounding the zoo, surrendered as soon as the rays of the powerful searchlight were cast upon them. Mr. Ditmars and the keepers said it was likely that had the searchlight not been used the wolves would have escaped.

TEST TO SHOW CAUSE OF TUNGSTEN-FILAMENT BREAKS

Whether a tungsten filament has broken in service, that is, when hot, or been parted by a jar or vibration when the current was not turned on, can be determined from an examination of the fracture. If the break occurred while the filament was cold the ends of the thread will show an almost square break. But if the lamp had been burning at the time, the ends will be discovered to be drawn down to a taper at the end of which a bead is formed. The cold break, on the contrary, shows a uniform section to the end. In examining the lamp filament a rather strong reading or magnifying glass should be used and the lamp held over a dark surface in good light. With these precautions the filament end can easily be observed.

Negligent lamp fitters sent out to install tungsten lamps sometimes allow the filaments to become broken during transportation and then, to exonerate their carelessness, report that the lamp burned out immediately after the current was turned on. In this way the tungsten lamp gets a "black eye" for a failure during operation and many such "burn-outs" are doubtless recorded which, if the truth were known, existed before current had been turned into the lamp. The new high-efficiency lamps are delicate pieces of apparatus, and lamp men must be trained to give them due care in handling while cold, but it is unjust to the manufacturers and the progress of the art to ascribe breakage really due to carelessness of the installer or customer as being the normal death of the lamp during operation.

Operating companies who are experimenting with the tungsten filament and keeping a comparative record of the performance of the lamps they place, will have a valuable check on the reports of "broken" and "burned out" by examining the lamps. Of course it sometimes happens that, due to jarring and rough handling while cold, the filament is strained and is all ready to break, so that when the current is turned on the burn-out that follows gives many of the evidences of a service failure, although carelessness is the principal contributing factor. But an inspection of the filament ends will certainly relieve the tungsten filament of some of its burden of reported failures and should be carried out in the interest of a fair show for the new illuminant.

MAY RETALIATE AGAINST BRITISH PATENT LAW

The International Congress for the Protection of Industrial Property which began its sessions at Stockholm, Sweden, on August 28th, took up the discussion of the British Patent Act in its effect on foreign countries. About 350 delegates weer in attendance, including 21 official delegates, who represent that number of foreign countries. Edward B. Moore, United States patent commissioner, is quoted by cable as saying:

"The result of the discussion on England's new patent law will probably be that the majority of nations belonging to the International Patent Union will enter a protest against it and recommend to the official congress to be held next year in Washington that some sort of retaliatory combination against Great Britain be formed whereby Great Britain must either become a party to their proposition or be excluded from all the benefits to be derived from such a combination."

Under the new law all articles patented in Great Britain and intended for the British market must be manufactured in that country, and the attempt on the part of the congress to have the law modified is of particular interest to American manufacturers of machinery largely used in British factories, who, having obtained the patent rights in Great Britain, continue to supply British factories with machines made in the United States.

The year of grace given foreign patentees under the British law closed August 28th, and henceforth foreign patents may be revoked in Great Britain unless the patented article is manufactured or the patented process is operated in the United Kingdom to an adequate extent.

A great number of foreign firms have already bought sites and started works in Great Britain, many others are making arrangements to do so. These are mainly German and American firms. It is estimated that $125,000,000 will thus be invested for the manufacture of articles formerly manufactured abroad, and a prominent expert in patent law thinks that no fewer than 8,000 patents granted to foreigners will come under the new law. Meanwhile British newspapers and workmen are congratulating themselves on the benefits they foresee for home industry.

EXPERIENCE WITH SERIES LUMINOUS ARC LAMPS[1]

By Charles R. McKay

This paper is intended to give in brief form the essential facts concerning a recent large installation of luminous-arc street lighting. In February, 1907, the Toledo Railways and Light Company started in regular service some 547 luminous arc lamps of the General Electric type for series street lighting. This number has been steadily increased until at the present time about 1,670 of these lamps are in regular service.

The first few hundred lamps were operated from belt-driven Brush arc generators, which machines

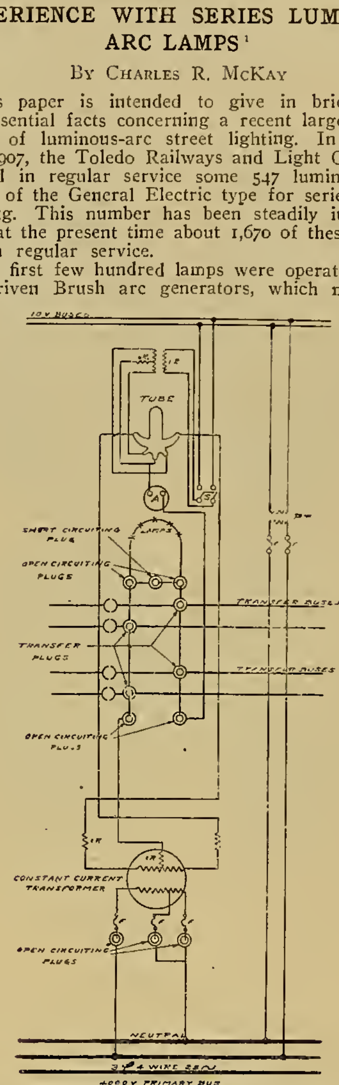


Fig. 1. Switchboard Wiring for Mercury-arc Panel

LUMINOUS-ARC STREET LIGHTING

were gradually removed as the installation of 25-cycle constant-current transformers with mercury-arc rectifiers and switchboard panels progressed.

All the street lighting in Toledo is now effected by means of such lamps, which, for the most part, are spaced approximately 600 feet apart in the residence and outlying districts of the city, while in special cases, such as the display illumination of Summit Street, the lamps are concentrated, there being throughout the shopping district on this street ornamental iron poles, each carrying two lamps and spaced approximately 80 feet apart opposite to each other on each side of the street.

Station Equipment

The required energy is generated in three-phase Curtis turbo-generators wound for 4,000 volts. Thirty-seven constant-current, 25-cycle, 50-light transformers, wound for 2,200 volts primary, were installed, together with a corresponding number of mercury-arc rectifiers and switchboard panels, as shown in Figs. 2 and 3. Thirty-four of these rectifier sets are of the air-cooled type, the blast being supplied by either of two fans driven by 12-horsepower, 25-cycle, induction motors, each of which has ample capacity for the entire 34 sets. Three sets with oil cooling have since been added to the original installation.

Six of the air-cooled transformers and rectifiers are installed in a sub-station in East Toledo, to which current is transmitted by submarine cable under the Maumee River. The entire operation of this sub-station at the Starr Avenue car barns is conducted by a car dispatcher without interfering with his ordinary duties.

1. A paper read before the Ohio Electric Light Association, August 26, 1908. The author is the manager of the light and power division of the Toledo Railways and Light Company, Toledo, O.

On the switchboard each circuit panel supports one rectifier, with adjustable blast gate, ammeter, excitation switch, primary, secondary and short-circuiting plugs, bus transfer plugs and tube-tilting handle. The wiring diagram is given in Fig. 1.

In the generating station a totalizing panel located in the center of the arc switchboard supports three indicating wattmeters, three recording wattmeters and two triple-pole, double-throw, fused switches, each of these switches controlling a blower motor. A three-phase, four-wire, 4,000-volt bus, controlled by a motor-operated oil switch, traverses the entire length of the arc switchboard behind the sub-bases. The transformers are so connected between the neutral and outer buses as to closely balance the system. The transformers stand in two parallel rows on the engine-room floor directly below the switchboard gallery, and their primary and secondary leads rise directly from the transformer terminals to the rear of the panels overhead.

In case of necessity, it is possible to supply power for the luminous arc lights by inverting either of two 1,000-kilowatt, 25-cycle, rotary converters, normally used to convert alternating current into direct current for operating the street railway. These two machines, together with a synchronous motor-generator set, are also utilized, when desirable, to compensate, by strengthening their fields, the lagging current taken from the generators by the rectifier sets.

Lines

All lines leave the power house in multiple-conductor lead-covered cables with 7/32-inch paper insulation on each conductor. After traversing the underground district in vitrified tile, or cement-lined iron duct, the circuits continue overhead on ordinary construction with double-petticoat glass insulators.

No unusual line troubles have occurred either on the aerial, underground or submarine lines, although surges, coincident with tube flashing, have occasionally punctured temporary wiring between transformer secondaries and rectifiers.

The lamps are generally hung over the center of the street intersections, at a height of approximately 25 feet, by means of suspension wires, and are lowered for trimming.

The first lamps were started during stormy winter weather, and some difficulties were encountered due to high winds rupturing the arcs. The light in this type of lamp issues chiefly from the arc itself, instead of from the positive crater, and, being much longer than the carbon arc, the magnetite arc is quite sensitive to rupture by air drafts, unless thoroughly protected by windproof casing and globe fit.

Originally, upper electrodes of three-quarter-inch diameter were in use, but these tended to oxidize, thus reducing the diameter and resulting in sticking or welding of electrodes. These difficulties have been satisfactorily remedied in the later type of lamps by securing windproof contact between globes and canopies, and by the use of upper electrodes of large-diameter copper, surrounded by a sheet-iron sleeve. The life of the

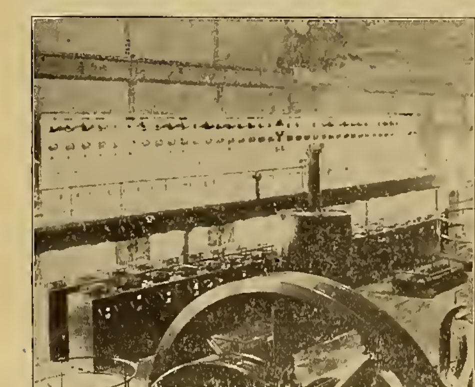


Fig. 2. Switchboard with Mercury-arc Rectifiers—Day View

LUMINOUS-ARC STREET LIGHTING

lower electrode has been increased from approximately 110 hours to over 160 hours, and it is expected that the upper electrode will last fully a year.

In operation the luminous arc lamps average from 320 to 324 watts per lamp, including line losses, as measured at the direct-current circuit terminals. The watts at the circuit terminals for the alternating-current 7½-ampere lamp averaged 525, showing an approximate reduction of 38 per cent. in energy per light supplied to the circuit.

The present 1,670 lamps, distributed over 37 circuits, are trimmed by three trimmers, each provided with horse and buggy, and about one per cent. of the lamps are in the shop as an average, for adjustment or minor repairs. Gazing directly at the luminous arc, there is discernible to the trained eye a slight frequency flicker, which is imperceptible in the general illumination. It is possible, in residence streets lined with trees and hence lacking reflecting walls, to read ordinary newspaper print at night midway between lamps spaced 550 to 600 feet apart.

The satisfaction afforded by the illumination from the new light is well illustrated by an incident of the Maumee River flood of February, 1908, when it became necessary to substitute without notice the original 7½-ampere enclosed alternating-current lamps in place of the luminous arc lamps, owing to the breakage by a falling bridge span of six arc circuits supplying some 300 lamps in East Toledo prior to equipping the above-mentioned sub-station. Vigorous protests to the City

Fig. 3. Switchboard with Mercury-arc Rectifiers—Night View

LUMINOUS-ARC STREET LIGHTING

Council from residents and merchants of East Toledo clearly expressed the public opinion as to which type of lamp gives the best illumination.

Efficiency and Power Factor

At the last annual meeting of this association, held in Toledo, during August, 1907, data were requested as to the efficiency and power factor of the system in actual practical operation. Conditions at that time did not permit the running of accurate tests, although approximate figures were available, which have since been verified by more detailed tests, carefully conducted, with the object of checking the manufacturers' guarantees, which have been closely confirmed.

The following tables show, under different conditions of load and transformer connections, the input and output figures, together with the resulting power factors and efficiencies:

Transformer on 100 per Cent. Tap

—	Load.		A. C. Input—25-Cycle.					D. C. Output.			
	Lamps.	Per Cent Full Load	Amperes.	Volts.	K. V. A.	K. W.	Per Cent. P. F.	Amperes.	Volts.	K. W.	Per Cent Efficiency.
A	50	100	13.74	2,308	31.70	17.55	55.4	4.04	3,899	15.75	89.8
B	37	74	13.70	2,303	31.55	14.17	45.0	4.13	2,892	11.94	84.3

Transformer on 80 per Cent. Tap

—	Load.		A. C. Input—25 Cycle.					D. C. Output.			
	Lamps.	Per Cent Full Load	Amperes.	Volts.	K. V. A.	K. W.	Per Cent P. F	Amperes.	Volts.	K. W.	Per Cent Efficiency.
C	37	92.5	10.01	2,294	22.96	13.59	59.3	4.17	2,877	12.00	88.4
D	25	62.5	9.29	2,305	21.43	10.09	47.1	4.12	1,952	8.04	79.7

	A	B	C	D
Volts per lamp D. C. (line losses inc.)	80.0	72.8	77.8	78.1
Watts per lamp D. C. (line losses inc.)	315.0	323.0	324.0	321.0
Watts per lamp A. C. (line losses inc.)	351.0	383.0	367.0	403.0

The efficiency indicated above is the ratio of direct-current output to the circuit to the alternating-current input to the constant-current transformer, and includes all losses in the transformers, reactances, rectifier, and switchboard wiring and connections. All instruments were calibrated before and after the tests.

Efficiency and power-factor readings are in each case averages of 10 separate tests, which showed practically no variation from each other. The primary alternating-current voltage during the test was about five per cent. above rated transformer voltage, which fact may account for the low-power factor. During each test the circuits were patrolled to insure that the full number of lamps specified were actually burning.

The values of the alternating-current input to the transformer under test were closely confirmed by both the indicating and the recording wattmeters on the totalizing panel, which gave averages for the entire installation; therefore, these values are not open to criticism as representing special conditions unattainable in normal operation.

Power for Air Blast

The following figures show the input to the blower motor with various numbers of blast gates opened:

Blower-motor Input

No. Blast Ports Open		K. W. Input	Av. K. W. per Blast.
0	(Fan running light)	3.37	.0
10	(Fan running light)	4.65	0.47
20	(Fan running light)	6.08	0.30
33	(Fan running light)	6.98	0.21

An important factor in the life and operation of mercury-rectifier tubes is the temperature range to which they are subjected, and unsatisfactory results from tubes of moderate voltage could perhaps frequently be attributed to improper temperature conditions. The blast temperature cannot readily be regulated in all seasons and localities, and therein may lie a strong inherent advantage of the oil-cooled type over the air-blast type.

Mercury Rectifiers

Until recently little if any data have been available with regard to the life of the rectifier tubes used in this system of street lighting. In the installation described in this paper, an exact and continuous record is kept of the life and performance of each tube. The manufacturers guarantee an average life for all tubes of 400 hours' operation.

The figures given below illustrate the average tube performance, up to June 1, 1908, besides, in

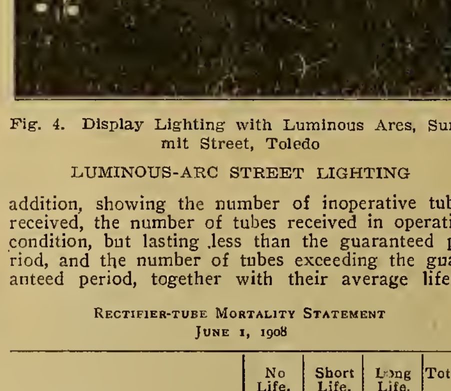


Fig. 4. Display Lighting with Luminous Arcs, Summit Street, Toledo

LUMINOUS-ARC STREET LIGHTING

addition, showing the number of inoperative tubes received, the number of tubes received in operative condition, but lasting less than the guaranteed period, and the number of tubes exceeding the guaranteed period, together with their average life.

Rectifier-tube Mortality Statement
June 1, 1908

	No Life.	Short Life.	Long Life.	Totals
No. tubes	6	45	44	95
Total hours	0	3,693	63,190	66,883
Average per tube	0	82	1,436	704

The foregoing record includes both oil-cooled and air-cooled tubes, but further experience with the oil-cooled tube is desirable in order to definitely establish a preference. There are, however, reasons for expecting greater life from the oil-cooled than from the air-cooled tubes.

There are many tubes in operation in this installation which have exceeded 2,000 hours' life, and several have exceeded 3,000 hours' life. The maximum recorded life of any tube up to June 1, 1908, was 3,589 hours and eight minutes. The average life of 23 tubes which burned out during May was 1,110 hours. Five of this number were inoperative when received. The average life of the remaining 18 was 1,476 hours.

Display Street Lighting

A strong demand has arisen among the merchants of Toledo for an extension of the display street lighting put into effect on Summit Street (Fig. 4). This is an excellent illustration of the commercial value of light in attracting valuable business from the dark and unattractive streets.

One-half of the cost of the Summit Street illumination is paid to the city by the property owners and merchants benefited thereby, and on several other streets the merchants, finding their trade shifting to Summit Street stores, have united in petitions, which have been approved by the City Council, to extend the same scheme of lighting to include their localities.

The Summit Street installation was carried out on the high-tension series system, with expensive underground construction and heavy ornamental iron poles. Consequently the total investment per lamp was unduly high, involving the future carrying of high fixed charges, notwithstanding the contract rate per lamp is the same as for lamps in the overhead district.

Reliable luminous arc lamps for multiple operation across 125-volt circuits, or two in series, on three-wire, 250-volt circuits are available. The installation of such lamps in congested districts where three-wire, direct-current underground mains exist, can frequently be carried out at a cost of but 50 to 65 per cent. of that required with the series system, and although the multiple lamp will draw on the station for about 30 per cent. additional power, the saving in fixed charges will generally far more than offset the additional power cost throughout the life of the lamp.

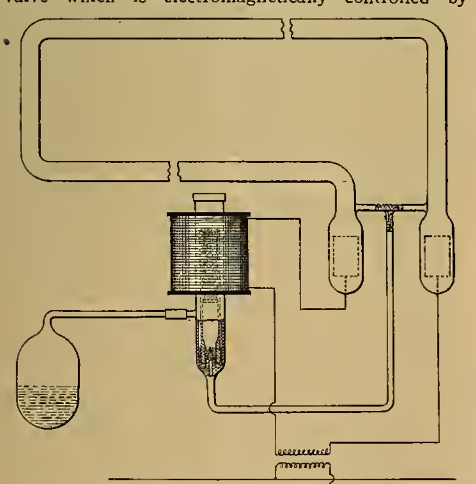
Conclusion

The luminous-arc-light system, operated from constant-current transformers and mercury rectifiers, is a commercial success, possesses high efficiency, is economical of power, is reliable in operation, is economical in maintenance, and insures a more satisfactory natural distribution of light for street illumination than either the open or enclosed carbon-arc-light systems.

INLET VALVE FOR VACUUM TUBE

In most forms of vacuum apparatus, such as vapor electric lamps, Crookes tubes, Geissler tubes and the related Moore tube, after continued passage of the electrical energy and heating of the glass walls the vacuum is observed to increase, probably due to some occlusion or absorption of the rarefied gases by the glass. A certain condition of partial vacuum is required for most of this kind of apparatus, and if the exhaustion ranges too high the required impressed voltage to effect a passage of electricity through the extremely rarefied gases becomes so high as to be inefficient. Accordingly, if some provision can be made to permit the influx of air or gas until the desired pressure is reached the useful life of action of the vacuum tube can be lengthened without baking or re-exhausting.

By the invention of Daniel McFarlane Moore, well-known for his work in bringing the uncertain light of the simple vacuum tube to a commercial status in the form of the Moore light, any desired gas is automatically introduced into the tube to maintain the state of partial vacuum required. A recent patent granted to Mr. Moore covers a device in which the apparatus for admitting the air or gas to the tube is greatly simplified. The arrangement of the inlet valve is clearly shown in the sketch herewith. The apparatus consists of a storage tank or receiver for a readily vaporizable liquid connected to the vacuum tube through the valve which is electromagnetically controlled by



INLET VALVE FOR VACUUM TUBE

the winding in series with the main lamp current. The branch tube leading into the lamp is shown filled with sand to prevent short-circuiting of the high-tension discharge.

The valve itself contains a pool of mercury which normally seals the ingress opening through the displacement due to the presence of a plunger. As the current in the tube increases the magnet winding lifts its armature, withdrawing the displacer and allowing the mercury to drop away from the inlet opening, thus admitting the gas which is given off by the liquid in the container. A minute quantity only flows before the pressure rises so as to cause the magnet to close the valve and stop the flow. A reduction of tension in the flask and communicating spaces up to the regulating valve below that which is necessary to practically maintain the contents in the liquid or solid condition will permit the evolution of more gas or vapor which will, therefore, be ready at a higher pressure in the chamber than in the tubes, so that a feed of gas will take place whenever the communication is opened by the gas-regulating valve.

OHIO ELECTRIC LIGHT ASSOCIATION

About 55 Ohio central stations, members of the Ohio Electric Light Association, were represented at the fourteenth annual convention of that strong association, held at Hotel Victory, Put-in-Bay Island, on August 25th, 26th and 27th. The total attendance was 225, including ladies and supply men—an excellent figure when it is considered that the isolated location of the meeting place made it impracticable to swell the attendance by local electrical men as might be the case were the meeting held in a large city. A substantial increase in membership was reported. President F. M. Tait of Dayton presided with urbanity and Secretary D. L. Gaskill of Greenville performed the duties of his office with courtesy and skill. A full program of papers on varied subjects was discussed, and much useful information was brought out. Several electrical manufacturing companies made instructive exhibits, and there were various enjoyable entertainment features, including dancing, card parties, musical entertainment, bathing and a banquet with vaudeville. In all respects the convention was successful.

Gas-engine Discussion

Secretary D. L. Gaskill of Greenville called the first session to order on Tuesday afternoon, August 25th. President F. M. Tait of Dayton had been called away on urgent business and was thus unavoidably absent. W. P. Engel of Defiance, former president and chairman of the executive committee, presided. The first paper on the program, "The Gas Engine in Central-station Work," was read by its author, William M. Adams of Elyria. Mr. Adams is a firm believer in the gas engine. Among other things he said:

"A great deal has been written and said about the unreliability of the gas engine in service. Did it ever occur to any of you how unreasonable such criticisms are, and upon what weak foundations they are based? I am prepared to say at this time it can be shown beyond a doubt, that the gas engine of today is a great deal more reliable than the steam plant; that a great deal less attention is required to keep a gas-engine plant in perfect condition than is required for a steam plant of equal size, and further, that the chances of failure of the gas plant are a great deal less than the steam plant. With the gas-engine plant we eliminate entirely the steam-boiler trouble with all its faults. As far as the engine itself is concerned, it has its delicate points, such as the igniter. The gas engineer that does not frequently examine the ignition system, keep his magnets and battery in order, would also let his steam plant get out of order. With the gas plant the only part that needs attention is the ignition system. There is no piston rod or valve stem or stuffing boxes to be packed or to blow steam.

"In summing up the gas engine there seems no good reason why it should not appeal to the electric-light association as an economical, reliable and efficient prime mover, and to the prospective purchaser of additional power units the installation of the gas engine where natural gas is available should be seriously considered by progressive managers for its very low cost, as well as its reliability. Where natural gas is not available, the question of producer gas in connection with gas engines should be considered before a steam plant is installed. Bituminous-coal-gas producers are now an assured fact. They are the only apparatus that will deliver a horsepower from one pound of coal, and while the first cost of a producer-gas engine will slightly exceed the cost of a steam boiler and engine, the saving in fuel alone will more than pay for the difference in investment the first year."

During the discussion Mr. Adams said his company pays 25 cents a thousand for gas. A rather better man is required to run a gas plant than a steam plant.

F. D. Elwell, Sidney: We have two three-cylinder upright gas engines of medium size. When we first put those engines in we needed a great deal of education to handle them. The ignition system and other things gave us trouble. We spark from the exciter through lamps, and also from a set of storage batteries. We have found that as long as we exercise "eternal vigilance" we do not have any serious trouble. The gas engines are as reliable as steam engines—as long as nothing breaks; but there are so many small parts that no amount of "eternal vigilance" will guard against occasional breakage. We have had a few shutdowns. We have also two steam engines, one of which will run during our peak. We keep up steam all night in the steam engines, ready to cut them in if necessary; but rarely do we have to do that. Still we have not found that we could dispense with our steam engines entirely.

Answering a question, Mr. Adams said: "We run our plant, which in the evening at peak load carries about 500 horsepower, with three men for the 24 hours. That is, on the inside; that has nothing to do with taking care of lamps and other work on the outside. We have three engineers." Later Mr. Adams added this: "One 'fault' with the gas engine is that the operation is so uniformly good that the engineer gets lazy; but with a good man in charge there is no reason why a gas plant should not last as long as a steam plant."

Secretary Gaskill read the paper of B. H. Smith, "Report on Gas Producer Plant." Mr. Smith is superintendent of the Lexington electric-light plant. The plant is a small one; the producer is of an

C. R. McKay, Toledo, President — J. C. Rothery, East Liverpool, Vice-President
F. M. Tait, Dayton, Chairman Executive Committee — D. L. Gaskill, Greenville, Secretary

NEW OFFICERS OF OHIO ELECTRIC LIGHT ASSOCIATION

old type, using anthracite. The gist of Mr. Smith's paper is given in this paragraph:

"With an average load of 10.2 kilowatts, about 18½ horsepower and a run of 3¼ hours, we consume 271 pounds of coal, including a standover loss of three pounds per hour. Deducting 56 pounds for standover, the fuel consumption during the run is 215 pounds, 2.2 pounds per horsepower-hour, or four pounds per kilowatt-hour. With coal at $4.90 a ton, the cost for fuel is one cent per kilowatt-hour. The entire cost, including oil, attendance, etc., is four cents per kilowatt-hour."

B. H. Gardner of the Dayton Lighting Company followed with his paper entitled "Report on an Oil-engine Plant in a City of 10,000 Inhabitants." The plant described is a municipal plant, and at the request of President Tait Mr. Gardner investigated it. There are two 225-horsepower vertical three-cylinder oil engines direct-connected to alternators. The cost of the whole plant, exclusive of buildings, was $44,000, or about $138 per kilowatt capacity. The plant has been in operation over two years, and there have been no shutdowns, the total repairs amounting to $215. It is said that the voltage regulation is not very good. Average oil consumption is 11.2 gallons per 100 kilowatt-hours. Oil costs 3.25 cents a gallon.

Mr. Gardner also reported on a producer-gas plant in a box factory in Dayton. Here there has been much annoyance, owing to loss of time in starting. The manager has no confidence whatever in his plant, and feels that it is only a question of a short time before it will be junked and replaced with electric drive.

The Smith and Gardner papers were discussed together. S. E. Folk of Bryan, operating a municipal plant, gave his experience with Diesel gas engines. This experience has been very satisfactory. The economy of the engine has been remarkable. "We put in current on the switchboard at 3½ to 4 cents per kilowatt-hour, including interest on sinking fund, labor, fuel and all operating expenses. Total cost of operation is 4.65 cents a kilowatt-hour. The duty has been all that we could desire. We have not been obliged to shut down at any time from any cause whatsoever. The maintenance has been much less and the labor less than with the steam engine that we

[Continued on page 174.]

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

JUDGING by the state conventions in the Middle West, there is no such thing as a depression in the electrical industry. The Ohio convention was held last week and the Michigan meeting the week before, and both were conspicuously successful gatherings, with good attendance, lively discussions and plenty of enthusiasm.

In this issue a comprehensive but condensed report is given of the fourteenth annual convention of the Ohio Electric Light Association, held on August 25th, 26th and 27th, on Put-in-Bay Island in Lake Erie. The convention was a good one in all essential particulars. The attendance was 225, which was net; that is, made up of persons who went to the convention with the sole purpose of attending it. When conventions are held in large cities there is often considerable incidental attendance, due to men interested in electrical work who drop in to attend a session or two; but this was not the case at this year's Ohio convention, owing to its isolated location.

The subjects engaging most attention were gas engines, getting new business and retaining old business, new uses of electricity, the question whether the station shall do wiring, tungsten lamps and luminous arc lamps. Thus a good deal of ground was covered; but there was informing discussion on all of these topics—a fact largely due to the very laudable plan of making the papers short, as a rule, in this way exhibiting the most useful function of a convention paper, which is to introduce a general interchange of experience and opinion.

There was a creditable display of instruments, small motors, transformers, lamps and reflectors, heating devices, and small parts and accessories generally. The attendance was about equally divided between central-station men and supply men; and in numerous instances in both classes there were several representatives from one company. Much valuable information was brought out at the sessions, as can be seen from the report. Charles R. McKay of Toledo, well known among central-station and other electrical men, was elected president, and Mr. Gaskill, the secretary, was re-elected as a matter of course. On the whole the convention was perhaps the best ever held by the Ohio Electric Light Association, which enters on a new year in its history stronger than ever before.

AN UNDEVELOPED FIELD for the use of electric power which is of great importance exists in the possible demand for current to operate ventilating-fan motors in school-houses and other public buildings and the still greater possibility of the use of electric power in operating vacuum-cleaning or electric sweeper outfits, portable or otherwise, for use in all kinds of buildings, public and private. In Toledo, for instance, there are 25 school buildings equipped with motor-driven ventilating fans. Current is supplied by the central station, and the business is most desirable, as it is entirely a day load and off the circuits by 4 p. m. It would hardly pay to install a private power plant in each building for this purpose, and station managers may well pay more attention to this class of business.

Intimately associated with the matter of ventilation is that of cleaning building interiors by the vacuum system, by electric sweepers, or by various combinations of the two. Here the opportunity extends not only to public buildings, hotels, theaters and the like, but to private residences as well. Electric power is by far the best available means of operating these useful twentieth-century devices, and the great extent of the field thus available to the enterprising central-station man is obvious.

But there is a larger aspect to this question of mechanical ventilation and cleaning in school-houses and public assembly rooms than that of the opportunity for furnishing electric power, important as this possibility is. This larger aspect relates to the health of the community and to lessening the danger of spreading disease by actually taking away the dust and dirt in the school-room and burning it, instead of dislodging it merely and allowing it to remain in the room, to be breathed with its possible accompaniment of disease germs. Nearly everyone has remarked the particles of dust dancing in a ray of sunshine penetrating a dark room. This dust may now be removed to a very large extent by modern methods of cleaning and ventilation, and it is electricity that is called upon to do the work.

Physicians and all others interested in modern methods of hygiene will give their assistance in the campaign against dust. The matter was discussed at last week's convention of the Ohio Electric Light Association, and Dr. W. F. Fitzgerald of Greenville, Ohio, who was present, said that the question of the method of cleaning school-houses and other public buildings had appealed to him for 25 years. "We send our children to these places," said he, "and confine them there where they may be infected with some contagious disease through defective methods of keeping the rooms clean; and if an effective process of cleaning can be secured its cost should be a matter of slight consideration." The speaker hoped that those present would carry home to their medical societies and city and county governments the hygienic side of the question. He assured them that medical men everywhere would give them hearty support.

Thus the men selling electric light and power can do a public service as well as advance their own interests by calling attention everywhere to the manifest advantages of mechanical ventilation and cleaning of public buildings.

ARCHITECTS have been guilty of many vagaries in connection with the electrical utilities in large buildings, but seldom has a more flagrant instance of incompetence in this respect been reported than in the case of the new county courthouse in Cleveland, if the Cleveland Plain Dealer is to be believed. In a recent issue the newspaper named declares that a Boston firm of experts, engaged to revise the plans for heating and ventilating the structure, finds that there is no provision for telephone wires in the building, while the arrangements for electric lighting are entirely inadequate. The sum of $876,000 has been spent on the building already, and the work is advanced 30 per cent. toward completion. The electrical defects in the plans appear to be numerous. We quote (and condense somewhat) from the Plain Dealer of August 27th:

> Such modern things as electric bells, electric clocks, watchmen's call boxes and vacuum cleaning systems seem to have been also unknown to the designer, for no provision was made for them. According to the report of the experts, the details for wiring the building are entirely inadequate. No slots have been provided in walls for electric wires and much masonry work will have to be torn out to receive them. Had it not been discovered in time there would either have been no telephones in the monumental building, they would have been placed outside the plaster, or else the entire building would have been ripped to pieces to receive them. In one circuit the experts say that the plans provide for a needless use of two tons of copper wiring which can be eliminated and $600 saved the county. In another instance the specifications provide for a board with 17 switches, where French & Hubbard [the experts] say that two will do. "It seems apparent," remarked Commissioner E. A. Cass, "that we must have these things planned anew, throwing away the old plans and securing entirely new ones. It is a mighty good thing these discrepancies have been discovered."

In large modern public buildings the electrical equipment is extensive. In the new Cook County Building in Chicago, for instance, there is provision for 15,000 incandescent lamps and 1,000 horsepower in motors. Current is taken from the central-station service, and four separate sets of mains connect the service board in the building with different generating sources of the electric-light company to provide against any emergency. The main operating switchboard has 10 panels and is 25 feet long. Two vertical raceways for risers are provided, and there are 52 cut-out cabinets and 1,500 electric-lighting circuits in the building. It is manifest that in planning such an installation as this an electrical engineer is required, leaving entirely out of consideration the very important subject of illuminating engineering, about which, as a class, architects do not know as much as some of them profess to do individually. Many of the larger firms of architects have electrical engineers in their employment or have close working arrangements with some firm of electrical engineers; but it is the fact that architects, with some honorable exceptions, are very self-sufficient in all that relates to the construction and operation of buildings, and hence are led into some ludicrous and costly blunders. The Cleveland case seems to be in point, and the moral is obvious.

THE DENVER FIRE-INSURANCE CASE

A number of fire-insurance companies recently brought suit against the Denver Gas and Electric Company for about $50,000. The claim was made that the electric company had, through its negligence, caused the fire that burned a church, and the insurance companies, having paid the loss, sought to recover from the electric company. While the case has been disposed of, the decision was not as favorable for the lighting company as was anticipated, yet it was sufficiently decisive to indicate that the insurance companies will not be likely to carry the matter any further.

The facts are that early one morning in April, 1906, a church took fire and burned to the ground. Previous to this fire there had been a severe wind and rain storm which had put some 8,000 telephones out of commission, the wires breaking and falling on the trolley and other wires all over the city. None of the wires of the Denver Gas and Electric Company, however, were out of order. About the time the church burned there were a number of other houses in the same neighborhood that took fire or had "electrical disturbances" in them.

The insurance companies set up three causes of action: First, that the company had failed to ground its secondary distributing system; second, that it failed to properly insulate its wires and to properly guard them from overhead wires; third, that the company failed to place and maintain automatic safety devices in its station to prevent the excessive flow of primary current into the customers' premises. The third cause of action was not pressed, however, and testimony was offered on the first two causes alone.

The strength of the complainant's case rested upon cumulative evidence of a number of other fires occurring in the neighborhood and at the same time and upon the same secondary system of distribution. An expert (?) employed by the insurance companies testified that the grounding of the secondary "always" and "absolutely" protects against fire. He also testified that by examining a burned spot on a gas pipe taken from a fixture in a residence where a fire occurred near a church he could tell from the looks of the burn that it was "unquestionably produced by an alternating current of 2,200 volts." When confronted with other samples of pipe that had been burned with currents of varying voltages, both direct and alternating, he, of course, became bewildered, and had to admit that he was unable to distinguish between them.

An attempt was also made to show that primary and secondary wires should be run on separate systems of poles, on different sides of the streets, or, in lieu of that, a screen or hammock should be placed between primaries and secondaries throughout the entire distributing section to prevent crosses between primaries and secondaries.

No direct testimony was introduced to show that 2,200 volts entered over the secondary wires, but various witnesses testified to having had their electric-light bulbs broken or blackened in neighboring houses and to having heard "buzzing noises" or "loud reports," and an attempt was made to convince the jury that these could only have come from an alternating current of 2,200 volts. As a matter of fact, all of the phenomena described could have been produced by 500 volts direct current.

The court was very lenient and allowed testimony and exhibits such as the National Electrical Code, city wiring rules, and the like, to be introduced, which oftentimes are considered to be "immaterial."

The company showed that its distributing lines were substantial and were well maintained; that on the night in question none of the wires were down; that it cut off its current as soon as requested by the fire department to do so, and that many of the electrical disturbances continued after its current was cut off. It also showed that its transformers were in good condition before and after the fire, and that as soon as its lines were cleared of the telephone wires the lighting service was immediately restored without repairs of any kind.

The jury was shown that in 1906, the date when this fire occurred, comparatively few electric-lighting plants in the country grounded their secondaries, and that whenever this was done, either then or now, it was for the purpose of protecting life rather than property They were also shown the absurdity of trying to tell the voltage or current, whether direct or alternating, that produces burns on a pipe, from the mere examination of the burns. We believe they also recognized the undesirability of running primaries on one side of the street and secondaries on the other, and of the impracticability of completely screening primaries from secondaries.

Some testimony was introduced to show that the church was wired with Underwriters' wire, wood cut-outs, soft-rubber insulating joints, and the like, but the judge held the position that, in view of previous decisions in Colorado courts, regardless of all these defects, if it could be shown that primary current entered the church through the negligence of the company, then the latter was to be held responsible.

The case dragged along in court for over three weeks, and after the jury had deliberated upon the matter for some time, it was found that they could not agree, although it was afterward learned that a majority sided with the company. The judge therefore discharged the jury.

The electric-light company had hoped to get a definite decision in the matter. This, however, was impossible, but no adverse precedent has been established, and in view of the outcome of this case it is probable that insurance companies will not be likely to sue on account of alleged electrical fires in the future unless they have better grounds upon which to rest their cases than existed in this case.

The Denver Gas and Electric Company is to be congratulated upon the successful outcome of the case, and all the electric-lighting companies in the country have reason to rejoice in the victory.

The foregoing account appears in the National Electric Light Association Bulletin for August, 1908, and was written by Mr. W. H. Blood, Jr., insurance expert for the association. In another article on the same subject Mr. Frank W. Frueauff of the Denver Gas and Electric Company says: "We had the benefit of the advice and suggestions of the expert, Mr. William H. Blood, Jr. Later, in defense, his testimony as an expert received the most careful consideration of the judge and jury, and while the insurance companies put on their experts, Mr. Blood's testimony was given the greatest credence. His qualifications entitled him to the respect and admiration of the jury, and in the opinion of the company's attorneys he proved the most capable witness that they had ever examined."

MUNICIPAL ELECTRICIANS AT DETROIT

The thirteenth annual convention of the International Association of Municipal Electricians was called to order by President R. A. Smith of Norfolk, Va., in the convention hall of the Ponchartrain Hotel, Detroit, Mich., at 10 o'clock on August 19th. The president introduced Mayor William B. Thompson of Detroit, who delivered an address of welcome to the visitors, emphasizing that all cities should send their electricians to these conventions. A response on behalf of the association was made by Mr. J. B. Yeakle of Baltimore, Md., in which he assured the mayor of the appreciation of the delegates for the sentiments expressed and their gratitude for the warm welcome extended.

When the convention reassembled in the afternoon, President Smith opened the session with his presidential address, which he followed by presenting a paper on "The Moving-picture Hazard." This occasioned a good deal of discussion among the municipal electricians. Several took the position that most of this class of fires were due to the operators' carelessness and that really the jurisdiction of the building inspector properly included the fireproof construction of the moving-picture outfit.

At the morning session on August 20th Mr. Walter M. Petty read his paper, "Storage Batteries for Signaling Systems." The discussion of this subject was rather general and prolonged, as it covered the many features of this perplexing question, the majority of those taking part advocating the use of cells of larger capacity than is the general practice at the present. The discussion covered the care, life and efficiency of the storage cell and took the entire time of the morning session.

In the afternoon Mr. Jerry Murphy of Cleveland, Ohio, gave a description of "A Modern Police Signal System," disclosing some of the details in use in his city. His paper was followed with a great deal of interest.

Mr. Julius Bernstein's paper, "Fundamental Principles of Fault Location," was next read and provoked many questions directed to the author. Mr. Clarence R. George then read his paper, "The Modern Fire-telegraph Central Office," in which the author gave out some of the "short cuts" used by him at Houston, Tex., for locating faults or "troubles."

On August 21st Prof. E. E. F. Creighton presented a short paper on "Protection from Lightning," on which, owing to the limited time, the discussion was curtailed.

Mr. T. C. O'Hearn of Cambridge, Mass., asked that the association take up the matter of the United States mail boxes being painted red with the postmaster-general, and it was the opinion of all present that if this order is carried out confusion and delay would result in many cases, as red has been the recognized color for fire-alarm boxes.

The report of the association's treasurer showed a balance of $284.74 remaining on hand.

Invitations were presented from Chicago, Ill., Binghamton, N. Y., Cincinnati, Ohio, Jamestown, N. Y., and Atlantic City, N. J., for the place of the fourteenth convention. The mayor of Jamestown was present and urged the members to come to his city. but Atlantic City was finally chosen for the next meeting. The convention then adjourned to the Casino at Belle Isle Park, where all the delegates and guests were served with a dinner by the Gamewell Fire Alarm Telegraph Company of New York.

The officers elected and committees appointed for the ensuing year are as follows: President, J. B. Yeakle of Baltimore, Md.; first vice-president, W. S. Devlin of New Castle, Pa.; second vice-president, H. C. Bundy of Watertown, N. Y.; secretary, Frank P. Foster of Corning, N. Y.; treasurer, C. E. Diehl of Harrisburg, Pa. The following committees were chosen: Inspection: L. L. Kingsbury, R. A. Smith and T. C. O'Hearn; Police Signal: A. C. Farrand, J. Murphy and A. L. Kittridge; Fire Telegraph: C. F. Gall, S. W. Manning and H. C. Bundy; Electric Light: C. A. Lundquist, A. L. Pierce and F. A. Cambridge; Outside Construction: W. S. Devlin, William Crane and John O'Brien.

WIRELESS WEATHER REPORTS AT SEA

Dr. Peter Polis, head of the meteorological observatory at Aachen, Germany, has come to America as the representative of the German government to consult with and interest the Department of Agriculture with a view of establishing a system of wireless weather reports from ships at sea, so that a daily report may be made of the weather on the Atlantic and prognostications made, just as on the land. It is his hope to establish co-operation between the weather services of the two governments.

The advantages of a daily weather chart of the sea will be of great value to skippers, especially those in the coastwise trade. The chances of shipwreck will be lessened, as captains warned of the approach of a storm can get out of the danger zone or make preparations to meet the stress of weather. Ships not carrying wireless will have the benefit of a 36-hour weather forecast of the North Atlantic before they leave a port, and then can always "get a line" on conditions from passing liners.

CHICAGO SUBWAYS MAY BE TUNNELED

Work on the downtown rehabilitation of Chicago street-car lines which has been held up pending the prospect of the early construction of passenger subways will now go on and the work of relaying the tracks will proceed without delay. Congestion in the loop district is increasing, but even if the subways should be begun almost immediately and pushed to conclusion with the greatest rapidly possible, the city, it is thought, could not afford to allow the work of downtown rehabilitation and the care of the downtown streets to wait for this to happen.

It was feared that in the construction of the underground tracks the newly rehabilitated lines of the surface roads would be torn up, but Bion J. Arnold, chairman of the board of supervising engineers, Chicago traction, has given assurance that the tunnels can be built without interfering with the surface.

WESTINGHOUSE READJUSTMENT

September 1st was the date set for the closing of subscriptions to the merchandise creditors' plan of readjustment of the Westinghouse Electric and Manufacturing Company; but dispatches from Pittsburg on that date reported that the readjustment committee had postponed its meeting to hear the report of the creditors' committee until September 21st. A number of the members of the readjustment committee are away from Pittsburg, or were on September 1st. The general feeling among financiers is that the receivers will be dismissed before the first of the year.

OHIO ELECTRIC LIGHT ASSOCIATION

[*Continued from page 171.*]

had previously." The air pressure runs up as high as 1,000 pounds to the square inch at times of peak load. There is no trouble from leaky valves. Two engines are run in parallel without difficulty. The regulation is within one per cent., but a Tirrill regulator is used.

C. C. Custer, Piqua: I think that the advantages of the gas engine are often overestimated, for the reason that the chief talking point is the low fuel cost. We all know from our experience with gas-engine plants that they very often have shut down very unexpectedly. If a gas engine goes wrong it occurs so suddenly that you do not have a chance to change over to a spare unit. If you can get a good gas engine—it is no use to get a poor one—I believe the cost of a gas engine is at least one and a half times the cost of a steam engine, and it may even approximate what the cost of the whole steam plant would be. If you have a compound condensing engine it is not any trouble to get a fuel economy of 0.7 cent per kilowatt-hour when the plant runs 24 hours a day, in a town of the same size as Bellefontaine. Reliability ought to outweigh a difference of a fraction of a cent per kilowatt-hour. Of course the fuel consumption is not the only consideration with an electric-light company. I believe the gentleman said, that, counting depreciation and interest on investment, he figures that they have been able to get something like a current cost of 4½ cents per kilowatt-hour. I think there are a great many steam plants that can beat that considerably—towns as small as Bryan.

Mr. Elwell: Regarding the first cost of the Diesel oil engine, I believe that a 250-horsepower Diesel oil engine up to a year or so ago was priced at $14,500. I understand they have since then raised that $1,000. A first-class gas engine of 280 horsepower or 300 horsepower, of either the Westinghouse, Koerting, or any other of the best makes, will cost about $6,000, and a first-class compound steam engine will probably, as you all know, run from $1,800 to $2,500 less than the gas engine.

Mr. Gardner: In competing with gas salesmen we often run against the statement that they make to prospective customers that anybody can run a gas engine; that a gas engine does not need any attention. I would like to ask Mr. Adams whether he agrees with any such statement as that.

Mr. Adams: That is one great mistake they make. Salesmen come around and tell those things, but that is not the fact. I have tried to interest steam engineers in this subject, and have told them in individual cases that the time was coming for them to take hold of the gas engine and that they should make themselves as familiar with it as with the steam engine. I gave one such steam engineer a job, and he tried it about a month, and then got disgusted. Ninety per cent. of steam engineers are opposed to the gas engine. Another mistake that salesmen make in selling gas engines is to sell a man a large unit when, perhaps, they ought rather to have sold him two smaller ones. But, so far as reliability goes, I think the gas engine is superior. There is no blowing out of flues, for instance.

Prof. F. C. Caldwell and others took part in the discussion before adjournment was taken for the day.

President Tait's Address

President Tait presided at Wednesday morning's session and all succeeding sessions. He delivered his annual address, in the course of which he said:

There has been a decided tendency during the last year for competitive electric companies in the same territory to consolidate, thereby effecting what is absolutely necessary for complete business and financial success in a public-service utility of any sort. It is only by the complete and absolute control of the electrical output in any community that a public-service corporation can lower its production and distribution costs, and thereby benefit the consumer as well as help the company.

But monopoly does not and cannot successfully mean disregard for the public rights and welfare, and I believe that any lighting company's responsibility increases in proportion to its complete and absolute monopoly of the lighting situation in its territory.

The workings of the state commissions on public utilities in several states have been going on for some time, and the opinion is gaining that competent commissions, with proper and just laws to work under, will eventually prove to be a good thing for the legitimate and honest electric company.

Several prominent bond houses have recently stated that certain bonds offered for sale were considered to be good, because, among other desirable features, the electric company was working under a competent commission, insuring safety and a square deal to the electric company and its interests.

The municipal-ownership idea seems to be gradually falling behind, and properly too, because each year is bringing the taxpayer to a better realization of the fact that "the public pays the bills."

In closing, President Tait paid a tribute to the tireless activity of Secretary Gaskill.

Visit of Astronomers

It happened that the Astronomical and Astrophysical Society of America was in session in the hotel coincident with the Ohio Electric Light Association. Secretary Gaskill suggested that the courtesies of the convention as to meetings, exhibits and entertainments be extended to the scientists, and this was done. The chair appointed T. D. Buckwell of Toledo and L. Clifford Anderson of Franklin to wait upon Prof. E. C. Pickering of Harvard, president of the astronomers' society, and communicate to him the action taken. Later Professor Pickering and Professor Lord of Ohio State University were escorted into the meeting and presented to the association by President Tait. Professor Pickering made a graceful speech thanking the Ohio association for its action, which was reciprocated. The incident was a pleasant interruption to the regular proceedings.

A Good Financial Showing

Mr. Gaskill submitted his report as secretary and treasurer for the year, showing gross receipts of $1,815.56, and disbursements of $1,577.64. He congratulated the association upon the very active and successful work accomplished, characterizing the year as the most successful one in the history of the association. In conclusion, he expressed his great appreciation of the valuable services of President Tait in assisting the secretary and in building up the membership of the association. The report was later duly audited and approved.

Street Lighting with Luminous Arcs Through Mercury Rectifiers

C. R. McKay of the Toledo Railways and Light Company read his paper on "Experiences with Luminous Arc Lamps," in which he described the brilliant lighting of Summit Street, Toledo, with magnetite (luminous) arc lamps, using mercury-arc rectifiers at the station. This interesting paper is given in full elsewhere in this issue. Referring to the statement made in the last paragraph but one of his paper, Mr. McKay explained that the statement only applied to the particular conditions therein mentioned, and that it would not be advisable to undertake to use the multiple arc lamp in a general distribution system of street lighting covering a large field. In answer to questions, Mr. McKay said that no frequency changers are used in the operation of these lamps, the 25-cycle current from the steam turbines being supplied to constant-current transformers and delivered by them at the same frequency to the rectifier tubes, which in turn change the 25-cycle current to a pulsating direct current. The efficiency of the rectifiers is rather higher than that of motor-generators, while additional running machinery is dispensed with. Practically no additional attendance is required at the switchboard. If a tube goes out on the switchboard the fact is readily observed, and it can be replaced with a new tube in a couple of minutes. The tubes will stand any reasonable voltage fluctuation, perhaps within 10 per cent. of normal.

In response to a query by the chair, H. P. Grabill of Ashland stated that in that city they were well satisfied with luminous arc lamps, and in contradistinction to the experience at Toledo this company was getting figures of 180 to 100 hours of burning with the lower electrode. The average outage per light per month on midnight moonlight schedule is one and a quarter hours. The company is well satisfied with the system.

Keeping Out Private Plants

B. H. Gardner of the Dayton Lighting Company read his paper on "Best Ways and Means of Getting Out and Keeping Out Private Plants in Central-station Territory." He said that the private-plant owner must be shown wherein central-station service will be better, and the figures must be produced proving that it will be cheaper. To produce these figures it is often necessary to make an actual test on the premises, determining the kilowatt-hour consumption, cost of coal, cost of labor, and all other items that enter into the finished cost. A judicious use of trial propositions will result in securing much valuable business that would probably never be secured in any other way.

In the discussion following, W. C. Anderson of Canton stated that in his city of 45,000 population there is not a single isolated lighting plant, and has not been for a number of years. This statement does not apply to factories.

Mr. Elwell of Sidney reported that in the case of several factories that were maintaining large steam plants and had their own dynamos he had had difficulty in securing their general lighting business, but had obtained some revenue for their night lighting. In a factory that had something like 200 lights wired up he would give them, say, a 30 or 40-light capacity, limiting the supply by fuse or circuit-breakers, so as to avoid getting tied up to the extent of their full capacity, for which he would get no return.

S. F. Messer said that at Warren two planing mills each had about 125 horsepower connected, and the saving to those plants was such that their monthly bills for electric service about equaled the cost of weekly service before by private plant. The saving was in the elimination of the shaft drive. The mills changed from a large shaft to a group drive, and also effected a saving in engineer's salary, etc. They still burn refuse for low-pressure steam for their dry kilns, but do not have to employ a fireman for that purpose.

Signs and Special Uses of Electricity

Papers by J. C. Rothery of the East Liverpool Traction and Light Company, C. A. Elliott of the Dayton Lighting Company, and H. Engle of the Youngstown Consolidated Gas and Electric Company, were read on the general subject of electric signs, outlining and other special uses of electricity as an adjunct to profitable central-station work.

Mr. Rothery suggested that signs be priced at a flat rate, based on about four cents per two-candlepower, 10-watt lamp. This would make a sign of 50 lights return $2 a week, averaging six hours per night the year around and would produce a satisfactory income to the central station, while at the same time pleasing the customer.

Mr. Elliott said that all decorative and display lighting should be controlled by the lighting company on an "off-the-peak" schedule. The window lighting should be handled in practically the same way.

Mr. Engle reported that his company places electric flatirons on 30 days' free trial. All burned-out units in flatirons are replaced free of charge. In relation to signs, he gave the following reasons why they should be used: (1) You are receiving near the maximum amount for outside without lowering in any way your revenue from the inside lighting. (2) With the means furnished by you your consumer is boosting his own business, with the result that he is a satisfied consumer. (3) You are giving a "flash" to the street, which leads people to know that the light company is alive and on to its job. (4) You are teaching your consumers to use more light, for, if his sign has been a success, you will have no trouble in closing him up for some other proposition which requires the use of more light.

In the discussion Messrs. Buckwell of Toledo and Gaskill of Greenville spoke of furnishing current to ventilating motors in school-houses. In Toledo 25 schools are so equipped. This is a new use for current, and of course entirely a day load—between 8 a. m. and 4 p. m. The whole subject of ventilating public buildings is becoming very important. Furnishing current for this purpose is exceptionally good business.

W. C. Anderson of Canton brought up the subject of electric sweepers or vacuum cleaners for school-houses and other public and private buildings. Some 30 or 40 of these outfits are in use in residences in Canton, and the ladies who use them with the electric-motor attachment are delighted with their operation. The matter of their employment in school-houses should be actively agitated as a sanitary measure and enforced by law.

Dr. W. F. Fitzgerald of Greenville heartily concurred in this view as a very important hygienic suggestion and one that would appeal to the medical profession as well as to the well-informed laity. He inquired as to the cost of installation of a vacuum sweeper operated by electric motor. Mr. Anderson answered that an outfit that would do the work a thousand times better than it is ordinarily done could be had for $60, and a more powerful sweeper is available at a higher price, and would cost only one cent an hour to operate. A hotel in Canton has a rather expensive installation which probably cost several hundred dollars; but the work can be done quite as well and very cheaply with a machine of low first cost. Mr. Gaskill inquired whether the cleaning could be used in a school room where there were stationary desks, and was informed that nozzles were manufactured to suit all conditions.

Mr. Gaskill reported that in the new library building of Miami University the plans provide for the installation of a vacuum cleaning system which the bids showed would cost $800 to install in the basement, with necessary piping to the several rooms and necessary motors and sweepers. This, however, is a complete system with motors and pumps for exhausting the air. The library building will cost $80,000.

Mr. Tait stated that recently a vacuum cleaning company in Dayton decided that it would like to test the machine. The Dayton Lighting Company offered to furnish the electric current provided they would locate the outfit on the sidewalk and clean the offices of the lighting company. This offer was accepted, and the demonstration attracted much attention.

How to Increase Business

In the absence of the writer, the paper by F. H. Plaice of Hastings, Mich., on "How Can We Best Increase Our Business?" was read by Secretary

Gaskill. Mr. Plaice's excellent paper is given in full in this issue of the Western Electrician. In the discussion C. W. Lee of New York pointed out the advantage of keeping in close touch with the daily and weekly papers. Newspaper space should be used to educate the people of the community on the varied uses of electricity. "As long as you have a standing with the newspaper men it does not make any difference whether a certain newspaper is opposed to the policy of the company or whether it may be advocating municipal ownership. Whenever you show the reporters that you are a source of news information and a help to the paper they will avail themselves of it."

W. P. Engel of Defiance related an instance where a line was erected to outlying territory, the consumer agreeing to pay $200 of the expense of erecting the line, with the understanding that as further connections were made he would be given a rebate; and under a flat rate of $1 minimum and 10 cents meter charge per kilowatt-hour, the result was that in less than a year sufficient houses were connected to enable the company to make a complete refund to the original consumer. The speaker said that the work done by Mr. Plaice at Hastings, Mich., had been felt favorably by electric-lighting companies in adjacent towns where there was keen gas are competition maintained at a flat rate of $2.50 a month, with renewals of mantles free and also free piping.

Miscellaneous Business

E. D. Strickland of Buffalo was given the privileges of the floor to "boost" for the Sons of Jove. He said the membership of the order was 1,700. "Co-operation," he added, "is founded upon mutual confidence. Mutual confidence is based on acquaintance and friendship, and therein arises the fraternal spirit of the order—fun and good-fellowship. But underneath all the fun and good-fellowship is a serious object, co-operation all together all the time for everything electrical." Mr. Strickland predicted that in time the order would number 25,000 to 30,000 members.

The nominating committee was announced. It consisted of W. J. Hanley of Cleveland, S. M. Rust of Greenville and T. D. Buckwell of Toledo.

Luncheon was served in the meeting hall.

Shall Central Stations Do Wiring?

Edward F. Gwynn of the Delaware Electric Light and Power Company presented the first of two papers on the question, "Shall Central Stations Do Wiring?" which was followed by a contribution on the same subject by C. C. Custer of the Miami Light, Heat and Power Company of Piqua, Ohio. Mr. Gwynn answered the question in the affirmative. He spoke of cities of 15,000 population and less, and gave several reasons for his conclusion. One may be quoted: "The supply house or equipment company (as you please to call it) has only one interest in dealing with the customer. That interest is the profit on the work, whereas the central station is after the consumer for the profit on the work and is also after the consumer for the line, which will be a permanent income to the central station. A few dollars may be waived in the cost of the installation, or nearly all the profit deducted, if it be found necessary, to secure a large, profitable consumer, when the central station is figuring on the work."

Mr. Custer said the question is a debatable one. He said: "It seems to me that this is a field where the central station should be a co-operator instead of a participator. I think it is possible to get good wiring done by private contractors, and such contractors should have the moral support and co-operation of the central station. When the electric-light company does the wiring there is a tendency on the part of a great many people to blame the company for every little thing that gets out of fix on the premises, as a switch getting out of order, for instance, and they will expect the company to make good all such defects for an unreasonable length of time after the wiring job is finished. I think these considerations make it unwise for the lighting company to be responsible for the wiring, for it should have as few points of difference with the consumer as possible."

There was considerabale discussion, and each method had its advocates. E. T. Selig of Mount Vernon said that the electric contractor should do the wiring, and that every contractor should be a booster for the central-station company. A live contractor will boost up an unprogressive station.

W. C. Anderson thought that in a city which only afforded work enough for one wiring concern that concern should be the central station, but as soon as it came to a point where there was competition in that field the company should get out of the business, and employ local contractors whenever it was necessary to do any free wiring. The very best solicitor is a wiring contractor, and relations with him should be so maintained that he will be endeavoring to sell motors instead of isolated plants. So far as possible the business should be turned over to the wiring contractor, to whom it properly belongs.

Mr. Howard spoke of one contractor in a small town who wired lighting fixtures with annunciator wire. In this place it is proposed to organize an electric construction company representing the central-station interests.

M. E. Turner of Cleveland gave an interesting account of the Cleveland plan. About two years ago the company initiated an installment plan of payments for wiring, the wiring being turned over to certain contractors. The first year some 500 houses were wired, but the company was not satisfied with the general results, and has adopted another plan which gives promise of being more successful, and up to this time about 1,000 houses have been wired under it. It accomplishes results and at the same time keeps the central station out of any liability or responsibility, either legal or moral. The company solicits the wiring of houses under a flat price per outlet. The contract is then turned over to any reliable wiring contractor who will work under this plan, viz., that he must undertake any houses turned over to him, whether he makes or loses money on them, and his price for wiring cannot exceed the printed schedule of flat rates at so much per outlet. The company gives the consumer credit on his electric-light bill of 15 per cent. of the cost of wiring and fixtures up to a total of $15; that is, 15 per cent on his total bill not exceeding $100 worth of fixtures and wiring. The fixture houses agree to sell fixtures also on the installment plan of payment. The plan has been working out very successfully during the last year, and the incentive for the man wiring houses to do soliciting is that he turns the contracts over for the wiring of houses on a pro rata basis, as to the number turned over to the company that he has solicited. The company figures upon turning to each wiring house that works under this plan at least one house for every one that the contractor turns in to the company. That means that the expense for soliciting per house is cut in half. The company also pays the contractor a bonus for each house that he turns in, which is in cash, and also helps with the contractor's soliciting expenses, so that the cost of soliciting to the contractor is small. Now the cumbersome part of the arrangement is that in order to relieve the company entirely from any moral or legal responsibility the consumer signs an application card in which it is stated definitely that he understands that the illuminating company does no wiring, and that his house is being wired by the wiring contractor. A postal card is also mailed to him when the contract reaches the office, but in which there is no reference to the illuminating company, but it simply says that the wiring contract has been accepted by a certain named wiring contractor, and that upon the receipt of a return postal card the wiring will be immediately started. The return postal card is addressed to the wiring contractor who gets the contract, and as soon as he receives the postal card he delivers it to the illuminating company, and the latter installs the service, and the contractor immediately proceeds with the installation of the wiring. In that way some 1,000 or 1,200 houses have been wired, every one of which is along the lines of the central-station mains, and the company has incurred no legal or moral responsibility, because every customer understands that the wiring is being done by the specified wiring contractor.

Illuminating Engineering

J. S. Codman of Boston read a paper on Illuminating Engineering." The object of the paper was to call attention to the great waste of electricity and light by the customers of the electric-light companies; to impress upon central-station men the desirability of co-operating with their customers to check this waste, and to urge upon them the importance of a knowledge of the fundamental principles of good illumination. A single extract is given: "I venture to say that you have nothing to fear and everything to gain from a reduction in the cost of electric light, heat or power, whether as the result of a reduction in the cost of producing electric energy or as the result of improved processes in the transformation of electric energy into light, heat and power. A reduction in the cost of producing electric energy benefits you directly. A reduction in the cost of transforming electric energy into light, heat and power directly benefits your customers, but most assuredly does it also benefit you indirectly by opening up increased opportunities for business. Electricity has many worlds yet to conquer, and when it can compete on equal terms as regards cost, its complete victory will be assured. Let us all, therefore, central-station men and manufacturers, get together and do our utmost toward bringing down the cost of electricity."

Prof. F. C. Caldwell discussed the paper. He said that illuminating engineering had been developed almost entirely by electrical engineers. He emphasized the necessity of education, even in such a self-evident proposition as the need of keeping lamps clean. He spoke of wiring switches in houses so that by a one-quarter turn the lamps most needed will be lighted; by another quarter turn other lamps, not used so often, will be lighted by the same switch. This arrangement increases cost of wiring, but is a distinct convenience.

Experiences with Tungsten Lamps

Secretary Gaskill read a report on "Experiences of Central Stations with Tungsten Lamps." Reports were received from 12 stations, and from them Mr. Gaskill formed the following conclusions:

1. That the tungsten lamp has been in use too short a time to judge fully as to its adaptability for general use.

2. That the price as now charged is exorbitant and will prevent its coming into general use, unless reduced.

3. That the life of the lamp is shorter than that claimed by the manufacturers, or that it does not permit of a wide range of conditions, such as must be met by any lamp in general use.

4. That the brilliancy and economy of the lamp are particularly good.

5. That, while fragile, it has borne shipping with fairly good results.

6. That discoloring of the lamps has not been bad, nor has such change affected the quality of the light.

7. That it is a valuable adjunct in meeting competition, and where installed in the proper manner, which must be vertical, it gives excellent results from the illuminating standpoint.

8. That the larger units as now made are most desirable.

9. That until the price is reduced, the most satisfactory method of disposing of them to the consumers is through the supply houses.

A long discussion ensued, broken by adjournment for the day and resumed on Thursday morning. A few of the points made are given.

George C. Osborn, Harrison, N. J.: The question has been asked by central stations why they should endeavor to install tungsten lamps among their customers who are exclusive electric-light users. That has been answered by one progressive central-station manager in this way: First—Take care of your friend who is an exclusive electric-light user, and retain his good-will by giving him the best that can be obtained for the amount of money that he has expended. Second—Get the lamps installed properly, which can only be done under your direction. This is better than having the suggestion come from outsiders, who will invariably advocate one-third the current for the same illumination rather than your policy, which will be three times the light for the same money. Third—Advocate the use of the lamps, showing some of your consumers how to make a saving, and then send your solicitor around to close the customer for that motor, sign or outline, that you have been working on for the last two years. If he makes this saving through the advice of a contractor the way for your solicitor to obtain more of his business on any of the above new work will hardly be smooth. Fourth—Remove the incentive for a competing electric-light plant or municipal-ownership proposition by removing the cause; that is, high prices for poor lighting.

Mr. Osborn also called attention to the new 250-watt tungsten lamp, which has a lower kilowatt-hour renewal cost than any other type in present use. This lamp gives a horizontal candlepower of 200, and with a reflector a distributed downward candlepower of 300.

Max Harris of Pittsburg directed attention to the fact that in the report the renewals of carbon-filament lamps were based on a rate of 1½ cents per kilowatt-hour. He said he would like to have a contract for maintaining all carbon-filament lamps installed at 1½ cents per kilowatt-hour. "It makes quite a difference in the presentation of the comparative cost of operation of the two different systems."

On the question of voltage fluctuation the general opinion of the central-station men seemed to be that the tungsten lamp would stand fluctuation better than the carbon-filament lamp. Speaking of fragility, A. C. F. Keleher of New York said: "At the present time the 60-watt lamp is far more serviceable than the others. Personally, I have carried one in a suit-case, which is heavy and is handled just like any ordinary suit-case, and it is operating O. K. I do not think the lamp is quite as fragile as people are led to believe; and the shortening of the life of the lamp and the other disadvantages of the lamp I think are directly due to the way in which they are installed by the people, not because of the faulty construction of the lamp."

F. W. Willcox, Harrison, N. J.: One good feature of the tungsten lamp is that the efficiency obtained has been secured with a simple form of incandescent lamp. It might have been the case that you would have had a device much more complicated, similar to the arc lamps or Nernst lamps, instead of a simple device, such as the incandescent lamp. Yet you obtain this efficiency at 1¼ watts per candle, with no more complication than is involved in the ordinary incandescent lamp. That means a great deal of saving in investment and writing off of old apparatus, because the lamp simply replaces itself in the ordinary course of renewals, and therefore there is no antiquation. The tungsten lamp is giving satisfactory service today, and it can be bought in sufficient quantities to meet any demand. It is giving satisfactory service in the various sizes. The only objection raised is the matter of cost. But the lamp pays for its cost several times over in the course of its life, as you can readily appreciate when I tell you that a 100-watt lamp will pay its additional cost over the equivalent candlepower in carbon lamps at any rate above one-half cent per kilowatt-hour.

Reference has been made to the larger sizes. Mr. Osborn spoke of the 250-watt tungsten lamp. That lamp I can recommend to you. It has proven, as far as tried, to be very hardy and durable. Where you do not desire to use clusters, where you have a limited number of outlets, one large volume of 250 watts is just the thing. The smaller size 25-watt lamp was referred to yesterday by one company as being anxiously awaited. It may be that that lamp will not be such a success perhaps as some anticipate, because the lamp does not save its increased costs to anywhere near the extent that the larger size lamps do. It is probable that the cost of the lamp will not be very much less than that of the 40-watt tungsten, and the saving, of course, will be nowhere near as great. I think in that connection that the 25-watt tantalum lamp should be seriously considered by central stations. That lamp is reasonable in price, listing but 50 cents at present, and while it has not as large candlepower as the ordinary 16-candlepower carbon lamp, yet, considering brilliancy, it is fully as satisfactory a lamp. It is serviceable and more hardy and durable than the tungsten lamp. The tantalum lamp has been materially improved in life since its introduction, giving a life on direct current well over 1,000 hours, and on alternating current of 60 cycles or less it is found that the light is about two-thirds of what it is on the direct current. German manufacturers of tantalum lamps seem to be doing a larger business than with the tungsten. It is disappointing that this tantalum lamp is not more widely used in this country. It is not as efficient as a tungsten, but in these smaller sizes this difference in efficiency is not of so much importance.

W. C. Anderson, Canton: Where you have natural-gas competition, as part of this state has, it is absolutely an impossibility to meet the cost of gas; but customers are very glad to pay more money, not only 50 per cent. more, but two or three times as much, to get a satisfactory light. That has been proven very well in our case, not with the tungsten lamp, because that has only been available a short time, but with other illuminants, the direct-current enclosed arc lamp, the Nernst lamp and the Gem lamp.

Answering the question of W. P. Engel, all the station men present reported that they had tungsten lamps in service; three reported that they were pushing these lamps energetically. Most of the plants seem to be selling lamps outright. Nearly all are selling current for tungstens at the same rate as for other lamps.

Mr. Willcox: A central station might increase its kilowatt-hour rate to cover the cost of tungsten renewals, which is about 1½ cents per kilowatt-hour, but otherwise I do not see how an increase can be justified.

President Tait: It seems to me that the better way to do that would be to give the man more wattage and a greater increase of light rather than an increased rate. It is bad policy to attempt to raise electric-lighting rates; it is all right to lower them, but when you start to raise them you get into trouble.

Mr. Custer, Piqua: It would be a good thing to get out of free-lamp renewals through the introduction of the tungsten lamps. At the price of tungstens we cannot furnish free renewals without charging an extra rate; but if the tungsten lamp is maintained at its candlepower throughout its life, there is a chance to get out of free-lamp renewals. If we are not able to raise the rate for lighting with tungsten lamps, it seems to me we can sell the lamps at cost to the consumer and not have to furnish him free renewals, which would save us about one-half cent per kilowatt-hour.

President Tait: On carbon lamps the cost of free renewals is about one-fourth cent per kilowatt-hour of current consumed.

Mr. Custer: That is a small amount, but there is a great deal of trouble with free renewals. People want to carry home a whole basketful and let them lay around for the children to break up.

President Tait: I would like to know if there is any prospect now or in the immediate future of buying the tungsten lamp more cheaply.

Mr. Willcox: It is a matter that only the future can reveal. It is not unreasonable to expect that ultimately the price will be probably reduced to one-half of what it is now, if the lamp is adopted and widely used. But the present outlook is that the lamp will not be reduced to the price of the carbon lamp. Of course, the greater efficiency of the tungsten should be considered in connection with its first cost.

Mr. Osborn: A lamp that will cost $1.80 will pay for itself ten times in 1,000 hours, so that it pays for itself at the end of 100 hours' use.

H. M. Browne of Detroit described the new Westinghouse-Nernst single-glower lamps. The hollow-tube glowers are of new material, and there is a new type of ballast. The multiple-glower lamps have also undergone a number of changes. The efficiency of the new unit in single-glower lamps will range from 1.2 to 1.4 watts per candle with regular alabaster globes; on the multiple glower it will run from 1 to 1.25 watts per candle, depending on the size of the lamp.

In answer to Mr. Codman's question it was shown that the plant managers present were equally divided in number between those in favor of the station handling the lamp exclusively and those putting them out in combination with the contractors. Mr. Leslie of Muncie, Ind., said that in that city the lamps were sold by the company to the contractors at cost and retailed by the contractors at list price.

Rejuvenation of Sons of Jove

One of the liveliest features of the convention was the initiation of the Rejuvenated Sons of Jove, the "bunch of boosters for everything electrical." Ten candidates were initiated into the mysteries of the order on Wednesday evening under the leadership of H. H. Cudmore of Cleveland and E. D. Strickland of Buffalo, as follows: Charles L. Bogner, Cleveland Electric Supply Company, Cleveland, Ohio; William A. Baker, American Electrical Heater Company, Detroit, Mich.; William R. Collins, New York and Ohio Company, Warren, Ohio; F. R. DuGuay, Erner Electric Company, Cleveland, Ohio; H. O. Dutter, Bucyrus Gas and Electric Company, Bucyrus, Ohio; F. L. Finch, Union Electric Company, Pittsburg; Warner Jones, Cleveland Electric Supply Company, Cleveland, Ohio; T. J. Smith, New Lexington Electric Company, New Lexington, Ohio; E. L. Van Winkle, Glover Electric Company, Cincinnati, Ohio; F. A. Williams, chief engineer, Hotel Victory, Put-in-Bay, Ohio.

New Members Admitted

At Thursday morning's session a satisfactory addition to the membership was made by electing 11 active and 18 associate member companies.

Election of Officers

On the recommendation of the nominating committee these officers were elected:

President—C. R. McKay, Toledo.

Vice-president—J. C. Rothery, East Liverpool.

Secretary-treasurer—D. L. Gaskill, Greenville.

Executive committee—F. M. Tait, Dayton; W. P. Engel, Defiance; M. E. Turner, Cleveland; W. F. Hubbell, Wauseon; L. G. White, Columbus.

Advisory committee—Samuel Scovil, Cleveland; F. M. Tait, Dayton; D. L. Gaskill, Greenville.

Publicity committee—E. L. Booth, Bellaire; W. A. Wolls, Columbus; W. C. Anderson, Canton.

Finance committee—T. D. Buckwell, Toledo; L. C. Anderson, Franklin; T. D. Elwell, Sidney.

Membership committee—W. J. Hanley, Cleveland; C. B. Rodgers, Tiffin; H. H. Cudmore, Cleveland; G. E. Miller, Cleveland; C. M. Lott, Hicksville.

Municipal Ownership

D. L. Gaskill of Greenville read his paper, entitled "Some of the Causes of Failure in Municipal Lighting Stations." He considered these failures under the headings of investment, construction, management, sub-management, service, rates and business methods. The paper was a vigorous and incisive one. Following is an extract: "The management that is now content to take only the business that comes to it without hustling for new would be considered out of date and unworthy of the confidence of the public. The better kind of management in municipal plants is impossible to find. In the first place, there is no need to hustle, for the management does not own the plant. There is no need to make a profit, because the management does not get the benefit of it. Hustling means work. Work in the public capacity is not proper, according to the American idea of politically managed bodies. Besides, pushing means increased business. Increased business means additional equipment. Additional equipment costs money, and municipal plants are shy on this article. The business activity in the municipally owned stations can be likened to a pup chasing his tail; the management may think they are working, but the public holds a different opinion, and the results show that they are not."

C. W. Lee praised the paper and pointed out the importance of a campaign of publicity in influencing public opinion on the subject.

Grounded Secondaries

L. C. Anderson of Franklin read a short paper on "Grounded Alternating-current Secondaries," in which he called attention to the dangers involved in operating alternating-current systems with ungrounded secondaries and spoke of the methods usually employed to secure satisfactory grounds. Mr. Anderson favors the 250-volt limit for grounding secondaries, rather than the 150-volt limit adopted by the National Electric Light Association.

Lightning Protection

Prof. E. E. F. Creighton of Schenectady delivered an interesting address on the subject of the protection of electrical circuits from lightning. He gave some of the results of the Las Animas investigation into the phenomena of lightning, which revealed some of the causes why multi-gap arresters sometimes fail. He described the two forms of aluminum lightning arresters—for direct current and alternating current—which have had a remarkable record of success. In concluding he gave some practical suggestions on the manner of grounding circuits. An effort will be made to present a full report of this instructive address in a later issue of the Western Electrician.

Proposed Constitutional Amendment

M. E. Turner of Cleveland gave notice of a proposed amendment to the constitution by which the manner of choosing the nominating committee will be changed. It is proposed that two members of the committee be elected by the association, two by the retiring members of the executive committee and one appointed by the president. As it is, the nominating committee is appointed by the executive committee.

Gas and Gasoline Competition.

At Thursday afternoon's session the paper of Fred Leslie of the Muncie (Ind.) Electric Light Company on "Gas and Gasoline Lighting Competition and Best Ways to Meet It" was read by the author. Flat rates form Mr. Leslie's method of meeting gas and gasoline competition. He said: "The flat-rate lighting plan with the use of Gem, tantalum and tungsten lamps is very attractive to certain classes of consumers, especially saloons, restaurants and other businesses open until 11 or 12 p. m., and rooms which require daytime lighting. It is a fact that the majority of central stations are afraid of flat rates, and they have reason to be afraid, providing the flat rate is not made high enough. These flat rates were made about two years ago, when the Gem and tantalum lamps first came into general use. The price charged is made strictly on the number of lamps installed. The tungsten lamp offers a still better proposition on the flat rate than either the Gem or tantalum. This is from the fact the consumer gets almost double the light for the money and less energy is consumed to produce it. We are putting out the 100-watt lamp on a flat rate of $1.50 per month; the 60-watt at 90 cents and the 40-watt at 60 cents, regardless of hours used. This produces an income of $180 per kilowatt-year connected. The original installations and renewals are furnished by the consumer. If the consumer were to use the 100-watt lamp on a meter he would reduce the hours burning to an average of six per day, which would net about 75 cents per month at a five-cent rate."

The discussion took the shape of an inquiry into the advantages or disadvantages of flat rates with tungsten lamps. Both Muncie, Ind., and Canton, Ohio, have district steam-heating systems, and if current is wasted it doesn't make so much difference, for in a way electricity is a by-product. All the speakers agreed that flat rates did not apply to residences. Mr. Anderson of Canton took a leading part in the discussion.

Mr. Bechstein, Sandusky: We have a little plant in our neighborhood where they have a flat-rate system. It is a municipal plant. They have only a night service. If you will stand on the main street when the machinery starts up at 4 o'clock you will see every light burning. If you are there when the plant shuts down in the morning you will see the lights all go out, just because the machinery stops. The only fellow who is busy around there is the fireman—and he is very busy!

Mr. Willcox: If it would be possible to produce a lamp consuming only one-tenth watt per candle, I think we would all agree that it would be very difficult to sell light by kilowatt-hour. While that is not a possibility of the immediate future, it has perhaps a bearing on the point as to what is the most practical way to sell illumination. The kilowatt-hour has a great many serious objections. It might come to a case where you would take the contract to light a man's place just as the water companies furnish water, on a certain definite basis of so much illumination for a given number of living rooms, which can always be calculated to mean an average consumption of light per room, and restrict waste by the use of a meter device so that the customer will not exceed his guaranteed amount.

At the conclusion of the discussion on Mr. Leslie's paper final adjournment was taken, although many remained to attend the complimentary banquet in the evening.

Convention Notes

F. J. Alderson represented the Electric Appliance Company of Chicago.

Harvey Mansfield appeared for the Jandus Electric Company of Cleveland.

Clarence W. Lee, president of the C. W. Lee Company, New York, told about central-station publicity campaigns. He found many attentive listeners.

C. P. Billings represented the S. K. Elliott Electric Company of Cleveland.

W. D. Dunsmore put in an appearance for the Central Electric Company of Chicago.

The Benjamin Electric Manufacturing Company of Chicago was represented by H. E. Watson.

The Fort Wayne Electric Works were represented by A. A. Serva, assistant sales manager.

James M. Gilchrist of the Federal Electric Company, Chicago, had something to say about electric signs.

The Standard Underground Cable Company of Pittsburg was represented by L. L. Parkinson of Pittsburg.

Harry E. Adams and A. I. Carney looked after the interests of the W. G. Nagel Electric Company of Toledo.

There were forty ladies attending the convention. A. A. Serva of Fort Wayne looked after their entertainment.

The National Carbon Company's delegation included N. C. Cotabish, A. B. Pyke and A. G. Summerell of Cleveland.

Douglas A. Brown of Cincinnati, official stenographer, performed his duties with his accustomed intelligence and zeal.

Edwin Williams put in an appearance for the insulated wire and cable department of the Diamond Rubber Company of Akron.

The Globe Electrical Company of Dayton, represented by A. B. Flagg and J. E. Swisher, gave away an aluminum wire gauge as a souvenir.

C. R. Lininger of the Pittsburg Transformer Company showed a 10-kilowatt high-efficiency transformer and distributed Pittsburg stogies and pretty-girl calendars.

Among the lamp men present were William R. Collins, New York and Ohio Company, Warren, Ohio, and Fred W. Godfrey, Bryan-Marsh Company, Cincinnati.

The Ideal Electric and Manufacturing Company of Mansfield, Ohio, represented by Clarence E. Delafield and S. E. Huenerfauth, exhibited a new single-phase motor.

The Invincible Electric Renovator Sales Company of Cleveland, represented by S. F. Valentine, attracted much attention by an aluminum electro-pneumatic house-cleaning outfit.

W. N. Matthews & Bro. of St. Louis appeared in the person of "Happy" Victor L. Crawford, who exploited "Matthews money savers"—anchors, cable clamps, Holdfast lamp guards, polerectors and Easy lamp changers.

Naturally the F. Bissell Company of Toledo sent a strong delegation. It included F. Bissell, V. I. Gray, A. F. Knierim and Frank M. Knierim. These gentlemen talked supplies and machinery effectively.

The Sterling Electrical Manufacturing Company of Warren, Ohio, represented by W. F. Benedict and J. T. Donahue, presented all comers with souvenir rules, tape measures and handsome celluloid blotting pads.

A. J. Mitchell, assistant sales manager of the Adams-Bagnall Electric Company of Cleveland, was present. He was thoughtful enough to distribute court-plaster to those about to be initiated into the Sons of Jove.

The H. W. Johns-Manville Company, through R. R. Braggins, manager of the electrical department at Cleveland, made an interesting display of insulating material, fuse devices, linolite, service and subway boxes, friction tape, etc.

The Sanitary Pump Company of Dayton attracted attention by a rotary pump operated by an electric motor. This set is manufactured for pressures up to 150 pounds and in sizes up to 1,000 gallons an hour. President Tait was kept busy answering questions about this exhibit.

Allis-Chalmers representatives were F. C. Colwell, district manager, Cincinnati, and C. B. Cook and S. Wolff of Cleveland. They had on display direct-current and alternating-current motors, a potential starter, a transformer, and a model of the blading of a 1,000-kilowatt steam turbine. This exhibit of machinery attracted much attention.

The Duncan Electric Manufacturing Company of Lafayette, Ind., had an interesting display in charge of Adrian Tobias, sales manager of the company. There were shown house-type meters for both alternating and direct current, Types B and C meters for switchboards, a new high-efficiency transformer and graphic recording ammeters and voltmeters; also a new system for the measurement of current, combining the total readings of any number of switchboard wattmeters, including curve-drawing apparatus showing load curves of both alternating-current and direct-current switchboard meters, singly or combined. The exhibit was of an educational nature and was attentively examined.

Western Electric arc lamps, Sunbeam incandescent tungsten lamps, small motors, etc., were on exhibition. The literature distributed was especially varied and attractive, particularly the new publications on power applications. Blue Bell glass paper weights, in the shape of a bell, and key-rings were distributed as souvenirs, and George H. Porter of Chicago and F. M. Shely of Cincinnati, who represented the Western Electric Company, were kept busy.

The Nernst Lamp Company of Pittsburg displayed a complete line of the new Westinghouse-Nernst units in both single-glower and multiple-glower types for alternating current and direct current. The exhibit was illuminated by 88-watt and three-glower units. The company was represented by Max Harris, general sales manager; H. M. Browne, manager of Detroit office; J. O. Little, manager of publicity department, and A. H. Horton and Alex Douglas of Detroit.

The Holophane Company made an attractive display of electrical glassware. A. C. F. Keleher of New York, representing the company in Ohio and Michigan, was in charge of the exhibit, and J. S. Codman, manager of the Boston office, was also present. Mr. Codman had a paper before the convention. Some interesting shades and reflectors of the new "equal-prism" type were shown, including window concentrators, especially for tungsten lamps, and the French type of reflector.

The Ambos-Cudmore Company, selling agent, Cleveland, was represented by H. H. Cudmore. This company now covers territory as far east as Rochester, N. Y., to the north and Altoona, Pa., on the south. It acts as agent for the Weston Electrical Instrument Company, Alphaduct company, the Bristol Company, Condit Electrical Manufacturing Company, Steel City Electric Company, Duncan Electric Manufacturing Company, Hartford Time Switch Company and Detroit Insulated Wire Company.

The Wagner Electric Manufacturing Company was represented by Dean Emerson of Cincinnati, Paul Sentman of the same place, and Thomas T. Richards representing the factory at St. Louis. In addition to its literature the Wagner company displayed a line of switchboard and portable instruments which created much interest, the central-station men asking many questions about the Wagner lamp-testing volt-wattmeter, going over its eight possible combinations with their outside men. As one central-station man said, "That's the medicine that cures the chronic kicker." The Wagner line of artistic photographs showing types of apparatus and details of construction was much admired, and many members of the association had their questions about construction pictorially answered by these photographs. The Wagner tables were a favorite meeting place for members and their guests.

The General Electric Company had a large room for its headquarters as well as an exhibit of six tungsten economy diffusers arranged on the ceiling of the spacious lobby where exhibits were displayed. These diffusers were of different types and attracted much attention. Other particularly interesting exhibits were the new 250-watt tungsten lamps with Holophane bowl reflectors, aluminum-cell lightning arresters, the new testing watt indicator for incandescent lamps, and drawings suggesting ornamental church-lighting fixtures designed to be beautiful and also to secure some efficiency in church lighting. Fan motors and heating devices were also displayed. As a souvenir a miniature lamp stickpin was distributed. The exhibit was in charge of W. J. Hanley, manager of the Cleveland office, and other "G. E." men present were F. H. Gale, Prof. E. E. F. Creighton and R. E. Russell of Schenectady, F. W. Willcox and George C. Osborn of Harrison, N. J., G. H. Stickney of West Lynn, Mass., H. C. Houck and C. R. Wallis of Cincinnati, H. B. Goodloe of Cleveland and L. R. Dunkle of Columbus.

Charles R. McKay of Toledo, the new president of the Ohio Electric Light Association, is manager of the light and power department of the Toledo Railways and Light Company. For several years he was district engineer in the Cincinnati office of the General Electric Company, going to Toledo about a year ago. He is a Johns Hopkins man and has had an extended experience in power transmission and construction work in the West. At one time he was chief engineer of the Sprague Electric Company in New York. He read a paper before the convention describing the interesting Summit Street magnetite-arc lighting in Toledo. J. C. Rothery, the new vice-president of the association, is general manager of the East Liverpool Light and Traction Company. He wrote a paper for the convention, but was not present to read it. The efficient secretary and treasurer, D. L. Gaskill of Greenville, was re-elected, as he has been regularly for several years. He is president of the Greenville Electric Light and Power Company. The new chairman of the executive committee is the retiring president, F. M. Tait, vice-president and manager of the Dayton Lighting Company. Mr. Tait is alert and progressive and is well known among central-station men. Portraits of these four officers are given on another page.

The Westinghouse Electric and Manufacturing Company was represented by G. E. Miller, manager of Cleveland office; A. Goodly, assistant manager of Detroit office; C. H. Davis of Detroit and the supply department at Pittsburg; W. B. Wilkinson, industrial and power department, Pittsburg; S. A. Fletcher, advertising division, Pittsburg, and Messrs. Vail and Nye of Cleveland, Schrantz of Cincinnati, Hughes of Columbus, Starrett and Stimerick of Pittsburg and McAdams of Detroit. The display of the company consisted of electric flatirons, fan motors, glue pots, a tailor's goose, measuring instruments, etc.

BOOK TABLE

Hydro-electric Power Developments. By Preston Player. New York city: McGraw Publishing Company. 1908. Pp. (4½ by 7½ inches), 65, with curves and tables. Price, in cloth, $1.

The promoter or capitalist with limited experience in hydro-electric operations, but having in view the development of some local waterpower, will do well to consider these "Notes" before investing his money. This little book will supply definite data and explain the organization and operation of hydro-electric plants so clearly that even the waterpower novice and the non-technical investor may count up the expenses of the plant and subtract them from the estimated returns before the building plans have been drawn.

The figures in the book are based upon the results of previous undertakings. The primary procedures in the way of obtaining options on the site, estimating values, possible market of power, etc., are explained in detail. The points to be considered in the engineering examination of the waterfall are outlined and the promoter is cautioned to consider the competition he will have to meet from other sources of energy. Estimates on the cost of the plant per horsepower will enable the investor to judge of the first outlay, and figures for the running expense will aid him in estimating the fixed costs of production. Many valuable technical treatises have been produced by engineering authorities on waterpower developments, but the present book seems to be one of the first to take the elementary financial viewpoint, which, after all, is all-important to the investor. This compact little volume will provide the local capitalist or promoter with a great deal of good advice on how to undertake the harnessing of the neighboring waterfall.

CENTRAL ELECTRIC RAILWAY ASSOCIATION

The first fall bi-monthly meeting of the Central Electric Railway Association of Indiana and Ohio for 1908 will be held in the Claypool Hotel, at Indianapolis, September 24th. The programme will consist of papers and discussions of interest and importance to the association. Papers will be read by David B. Rushmore of the engineering, power and mining department of the General Electric Company, Schenectady, N. Y., on "Recent Developments of Lightning Arresters;" Ellis C. Carpenter, general claim adjuster of the Indiana Union Traction Company, "The Benefits of the Index Bureau;" E. G. Hindert of Elyria, Ohio, chief engineer of power, Cleveland, Southwest and Columbus Railway Company, "Electric-railway Return Current." A fourth paper will be read by Mr. G. H. Kelsay, superintendent of power, Indiana Union Traction Company, Anderson, Ind., whose subject is yet to be announced. An innovation will be introduced at this convention in the form of musical numbers, interspersed between the reading of the papers, by a glee club, whose members are connected with the Indiana Union Traction Company.

FREE TECHNICAL HIGH SCHOOLS

Technical high schools, as a part of the Chicago free public-school system, are now planned by the city educational authorities. Officially these will be known as "continuation" schools where boys between the ages of 14 and 18, who have left school and gone to work, can study subjects which will be of value and use in their daily work. The continuation schools will be located in industrial districts and downtown in the Loop, and employers asked to arrange hours for the attendance of their employes. Work in a number of branches of technical science and engineering is now given at the Crane and Lane high schools.

SELLING ELECTRICITY

Under this heading will appear, from time to time, articles, suggestions and examples which will be of assistance in the constant effort to increase the existing demand for electric current and to create new demands.

HOW CAN WE BEST INCREASE OUR BUSINESS?[1]

By F. H. Plaice

In preparing this paper, the supposition is, that the situation has been well canvassed; that the plant is able to produce and deliver to the switchboard electricity at a cost as low or lower than any other power plant in the community; that the service is reliable and dependable; that the distributing system is able to meet the demands that will be made upon it as a result of an aggressive business hunt, and that the entire force, from the engine "swipe" to the president, is thoroughly imbued with the determination of "making things hum."

Given these conditions, the chances are the company will make a decided success, but if any one of them is lacking, and left to go uncorrected, the result will be indifferent.

Undoubtedly, the most common cause of failure to get the proper results from a new-business campaign is lack of preparation and insufficient knowledge of the situation.

When we go into the market to sell, salesmanship becomes the great essential. Some have the talent naturally; others must acquire it; and some can never reach the goal.

The salesman in any line must have absolute faith in his wares and also in the ability of those above him to "deliver the goods;" but how much more important is this faith when the article to be sold is an invisible, intangible something, the presence of which cannot be determined until it is doing its work.

The electricity salesman, then, must be an enthusiast, a dreamer, an engineer, an artist, a machinist, a tactician and an all-around student of human nature. He must be able to keep his temper under any and all conditions, must actually know what he is talking about, and must have the "hang-on" characteristics of the bulldog developed to the highest possible point. His faith in himself and his wares must be so overpowering that the prospective customer will be dragged into synchronism in spite of himself.

To go to a large manufacturer who for a lifetime has successfully operated his factory by means of a faithful steam engine and ask that that faithful servant be thrown to one side, and that an almost unknown motive power be substituted for the well-known, at a prospective cost of perhaps several thousand dollars, all because of the saving of a fraction of a cent per horsepower-hour which is promised him, but of which the manufacturer knows nothing, certainly requires the very highest grade of enthusiasm and sanguine faith, in order that the proposition shall even be considered.

The moral of this, then, is that the men we intrust with the selling of our output must be of the highest type. Do not do as many companies do and leave the matter in the hands of the meter-reader and the trouble-man, for while these are both in their way responsible members of the new-business force, they are not the ones to be intrusted with the entire responsibility.

Next, where shall we seek for the new customers about whom we are talking?

We electric companies have three great fields in which our product is naturally supreme, and it remains for us properly to educate our public in order that we shall get that to which we are entitled:

First, there is the artificial-lighting field; second, the field of mechanical work, and third, that great but as yet almost untouched field of heating.

We are, therefore, safe in making the statement that our product can be and will be sold to every member of the human race and that our saturation point is so far in the future that to talk about it is laughable.

The educational phase is probably the most important of any of the many conditions surrounding the extended sale of electricity, and the one that should be studied the closest.

Tell me how many of your customers know that a sewing machine can be run by a tiny motor which will use less current than the better-known 16-candlepower lamp, or that the special nightmare of the good housewife—washing day—can be driven to the realms of oblivion by means of electricity and a small motor, at a cost of but a few cents per hour. I will wager that at least one-half the customers of all the companies represented here have yet to know that there is such a thing as an electric flatiron, and that probably another one-fourth do not know what the electric flatiron looks like.

Education, then, is what we must foster. The public is quick to avail itself of such meager opportunities as it usually gets, and, like other willing students, learns rapidly, and you will be called upon to do many things for which the manufacturing end of your business has not as yet provided.

"How Shall We Best Educate Our Community?" is, after all, the real meaning of the heading of this paper, for, if we educate the community, it will do the rest, and our business will increase in direct ratio with the education.

There are many different ways of educating, such as outline lighting campaigns, sign campaigns, electric shows, summer-park lighting, demonstration displays, canvassing, advertising, signs, bulletins, circulars, etc.

If you are operating a night service only, arrange at once to run all the time and give your community a chance to show you what they think of the proposition. In making an energetic push after new business, we will find that our growth will be faster than the public at large is able to grasp, and it will become necessary to do a great deal of demonstrating. We must stand ready at all times to make a dollar-and-cents proposition on the probable cost of a certain service, and then back it up with a guarantee. Not until we have proven beyond a doubt that we know our business and have satisfied the customer to that effect, will he or she become an active electricity champion.

Do not tell your prospect that a 16-candlepower lamp will use so many watts in such and such a time—he may ask you what a watt looks like—but talk to him in the more familiar language of dollars and cents. What he does not understand will not interest him to the point that he must be interested in order that you may do business with him.

When you are up against a motor proposition, the case requires a thorough knowledge of the power requirements of the different classes of machinery and general power usages, but is, in other ways, not a difficult problem, in order that the inevitable query, "How much will it cost," may be answered.

One point, before going farther, in regard to this new-business hustling, and that is the cost. Many companies think that all they are going to find it necessary to expend on the proposition is the salary of the solicitor, and that they can make about 1,000 per cent. dividends the first year after such a campaign. I want to undeceive them. An electric company developing its territory in the ordinary manner so as to keep about even with the usual growth of the community will probably expend upon extensions as much as it clears over all expenses, and when the same company begins to increase its business faster than normal, the construction account will take wings and fly in a manner that will put the Wright Brothers of balloon fame to shame.

When you get "A" enthused over your service, you are likely to get "B" also, and "C" and "D," and all the rest of the alphabet. Now "A" may live on a street that you cover with your mains, but "B" may live on the next one, and "D" still a block farther on, and so on, to "Z." It is just as important to the welfare of your business that "Z" be hitched up at once as it is that "A" gets his service; otherwise you are undoing a hundredfold what you started out to do. When a prospect wants to be connected, you will find it wise to connect him; otherwise you may want him some day and find that not only is he adverse to your proposition, but he is taking every opportunity that offers to work against you.

In the ordinary course of business growth the suburbs are laid out, streets graded, and houses built, after which comes water, gas and electricity in the order named. Under the new propaganda the addition is platted and the electric wires strung even before the streets are graded, so that when a house is built the service may be installed from the beginning. We must pioneer in every field, not follow.

Shall we advertise? This is a very important question, but there can be no hesitancy in making answer thereto. We must, but advertising does not necessarily imply a contract for a certain amount of space in each issue of the home papers. Far from it, for, outside of its possible good effects on the publishers themselves, it does not pay very big returns on the investment. We will admit that a limited amount of money spent in newspaper advertising is necessary and desirable, in order that the papers may take an interest in our work, but to expect large returns from newspaper advertising is to be disappointed. The same amount spent in demonstrations will show far larger returns.

Place fans, irons, lights, motors, large and small, or any other appliances that will become a consumer of electricity in service, on trial. Ninety-five times out of a hundred you will close the deal; the expenses of the five failures should be counted as that much advertising. We ourselves make it a rule to withhold our installing bill until the first month's service bill is presented, thus leaving the customer the privilege of a month's trial at our risk. We have installed hundreds of horsepower of motors during the last few months in this manner and have yet to fall down; one case in mind involved 25 motors which, together with the other installations, reached over $4,000.

Carry the same idea into all lines of your work. For instance a church or other organization may be giving an entertainment, and want some form of special service. It is good business policy to take advantage of all such opportunities to get into the limelight with your product. This form of advertising is rather expensive, but the cost is mostly made up of labor, and the returns are amply remunerative to justify.

If you have an idea in the way of street illumination that you want to present to your citizens, there is no better way than for you to go ahead and make a sample installation at your own expense, so that they may see just what you have in mind. The seeing will often win the day and bring you returns that could not have been secured otherwise. All this is advertising, and the cost of failures should be charged to that item of expense, while the successes should be able to pay their own way.

Work.—You may advertise; you may solicit; you may make attractive rates and inducements, but if you do not stand back of every proposition yourself—I am talking to the managers now—by being "Johnny-on-the-spot," you will fail. The manager of a wideawake electric company will not have time to make garden or mow his lawn, but will be going without his dinner on many occasions. He will become an erratic member of the family circle and a still more erratic attendant at his office desk. He will find it necessary to spend a large portion of his time on the outside in constant touch with his men and the work. His lieutenants will greatly appreciate the chance to take up difficult propositions on the spot, where all the phases can be gone over knowingly, and will do much better work as a result. A word here and a suggestion there will do wonders in the general results to be accomplished. The example set will also be an incentive, and you will find that as days go by your men will gradually wean away from the quit-with-the-whistle idea, and will be just as anxious as you yourself are to see a task finished. You will find that time will become your most valuable asset and that sleep, meals and everything else will be sacrificed to the good of the cause.

Promptness.—This is one of the weak points of many companies, and one that is usually the last condition to be blamed when things do not seem to come as they should. A customer calls up and reports that his lights do not burn, and then lives on a hot plate until his troubles are rectified. He keeps geting hotter and hotter as the minutes fly, and if he is not relieved, he may reach the danger point, and an explosion follow. Or he may be a power user, who has a large number of employes standing around idle while he is waiting on you and yours, and here again speed in responding to a trouble call is very important. A prospective customer for, let us say, power, may have an accident to his power plant and ask you to install a motor as quick as possible. Do not travel by freight in responding to such a call, but do business by express. Do not let an application go without attention a minute longer than you have to, and aim at all times to make your service synonymous with promptness, reliability and economy. Train your community to the point where, when they talk about lighting, it will be understood by all that electric lights are meant, and the word "power" will be but another name for electric motors. Do this, and you will have no desire or need for asking the question, "How Can We Best Increase Our Business?"

1. A paper presented to the Ohio Electric Light Association at Put-in-Bay Island on August 26, 1908. The author, now manager of the Thornapple Gas and Electric Company of Hastings, Mich., has had remarkable success in selling electricity.

POWER BUSINESS IN GRAND RAPIDS

The Grand Rapids-Muskegon Power Company, of which H. W. Hillman is manager, reports a total of 559 power customers, using 1,231 motors to a total capacity of 15,947 horsepower. The largest customer is the Grand Rapids, Grand Haven and Muskegon Railway, which takes current for seven rotaries, aggreagting 2,380 horsepower. Other large customers are the Grand Rapids, Holland and Chicago Railway, 1,608 horsepower; Brunswick-Balke-Collender Company, 1,319½ horsepower; Amazon Knitting Company, 722 horsepower; Shaw Electric Crane Company, 609½ horsepower. Of the 559 power customers, 476 use motors of aggregate capacity of 25 horsepower or less.

OBITUARY

PROF. HENRI BECQUEREL

Antoine Henri Becquerel, best known perhaps as the discoverer of the rays to which his name was given, died at Paris on August 24th. His death, at the comparative early age of 56 years, closes the distinguished and useful scientific career of an investigator, whose work extended from practical problems of engineering to the most abstruse studies in the realm of pure science.

PROF. HENRI BECQUEREL

Henri Becquerel was the son and grandson of two notable physicists, and at the age of 20 entered the Ecole Polytechnique and later spent three years in the study of civil engineering at the Ecole des Ponts et Chaussées. He was soon attracted by the study of pure science, and in 1878, then 26 years of age, he entered the Museum of Natural History, where all his great work of later years was done Here he prosecuted diligent researches in the fields of electricity, magnetism, optics and meteorology, all directed toward the study of electro-optic phenomena, such as the invisible infra-red spectrum and the absorption of light.

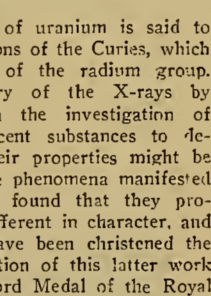
Assuming Faraday's announcement of the electro-magnetic theory of light, Becquerel was able to show a fundamental relation between the rotary magnetic power of bodies and a simple function of their index of refraction. He discovered the Faraday phenomenon in gases, a new domain, by the aid of delicate and ingenious devices. He opened up a new field for the spectroscope in discovering the invisible vapors of different metals by projecting on a phosphorescent screen the spectra of incandescent metallic vapors.

His work with the salts of uranium is said to have inspired the investigations of the Curies, which resulted in the separation of the radium group. Shortly after the discovery of the X-rays by Roentgen, Becquerel began the investigation of phosphorescent and fluorescent substances to determine whether or not their properties might be due to causes similar to the phenomena manifested in the Crookes tube. He found that they projected emanations totally different in character, and these forms of radiation have been christened the Becquerel rays. In recognition of this latter work he was awarded the Rumford Medal of the Royal Society of England.

Although Becquerel's extensive laboratory work had been done in the Museum of Natural History his activities were not confined to the museum, for he was actively engaged at the Conservatoire des Arts et Metiers and was also one of the chief engineers of the Department des Ponts et Chaussées. He had been a member of the French Academy of Sciences since 1889, and at the time of his death was its permanent secretary.

JOHN J. GREENOUGH

John J. Greenough, scientist, inventor and author, died on August 26th at his home in Brookline, Mass., at the age of 96. He was superintendent of the United States Patent Office in Washington from 1837 to 1841, and was one of the most versatile men that Boston, his native place, has ever claimed as a son and citizen.



JOHN J. GREENOUGH

He first studied medicine and then law. In 1832 he was associated in the business of a type founder, and in the following year brought out the first pictorial magazine published in this country, an American reprint of the Penny Magazine, an English publication. Then came his patent-office experience, followed by practice for some time as a patent lawyer in Washington.

A little later he formed a partnership with Prof. C. G. Page, and they built an electric locomotive, the Page electro-magnetic engine. Congress appropriating $20,000 in aid of the experiment. The engine ran from Washington to Bladensburg on the Baltimore and Ohio road at a speed of 19 miles an hour, the power being supplied by a Grove battery.

In 1853, with Mr. Page and a Mr. Fleischmann, he established the American Polytechnic Journal. Later he invented a shoe-pegging machine and sold the patent for $20,000. It is said to have netted its purchasers $5,000,000. He invented a sewing-machine also, and many other practical devices in the course of his long and eventful career. He also contributed numerous scientific articles to periodicals, winning much distinction in this line of authorship.

In recent years he had studied the problem of aerial navigation, and condemned experiments with the dirigible balloon as a waste of time and energy. He held the theory that the birds furnish the fundamental solution. Two years ago, on his ninety-fourth birthday, Mr. Greenough completed a book upon whose authorship he had spent considerable time, entitled "The Origin of Superstition."

Despite his advanced years Mr. Greenough retained his mental keenness and activity to his last days. The funeral took place from his home in Brookline on August 28th.

COAL INDUSTRY IN INDIANA

Indiana continues to rank sixth among the coal-producing states of the Union, and in 1907 it was a close rival of Alabama for fifth place.

The total coal production of the state in 1907 was 13,085,713 short tons, having a spot value of $15,114,300, an increase over the production of the preceding year of 1,893,153 short tons, or 15.66 per cent., in quantity, and of $1,998,039, or 15.23 per cent., in value.

The total number of men employed in the coal mines of Indiana in 1907 was 21,022, who worked an average of 197 days, against 20,970 men, who worked an average of 175 days, in 1906. The average production for each man employed in 1907 was 665 short tons, against 576.7 tons in 1906 and 469.7 tons in 1905. The average daily tonnage per man was 3.38 in 1907, against 3.3 in 1906 and 3.11 in 1905. The increased productive capacity per man was due in part to the increased use of mining machinery, the statistics for 1907 showing a total of 513 mining machines in use. In 1907 the percentage of the machine-mined product to the total was 37.97.

The eastern edge of the eastern interior (or central) coal field underlies the southwest portion of Indiana, the total area in the state embracing 6,500 square miles and underlying 26 different counties, in 18 of which at present coal is produced on a commercial scale. All of the coal produced in Indiana is classed as bituminous coal.

M. R. Campbell of the United States Geological Survey estimates that the coal fields of Indiana originally contained 44,160,000,000 short tons of coal. The aggregate production to the close of 1907 amounted to 159,440,390 short tons, and Mr. Campbell estimates the exhaustion represented by this production at 239,000,000 tons, or 0.54 of 1 per cent. of the estimated original supply.

THE MARSEILLES ELECTRICAL EXHIBITION

The International Exhibition of Applied Electricity, now being held in the grounds of the Prado Park, Marseilles, has proved a comprehensive exposition of the electrical industry. A great number of exhibits have been installed in the grounds, which enclose 60 acres of picturesque architecture and gardening. For lighting and power purposes the various electrical concerns in Marseilles sent to the exhibition machines rated at 2,500 kilowatts, at 5,500 volts, furnishing three-phase current at 50 cycles. Two groups of converters, the one of 500 kilowatts and the other of 300 kilowatts, transform a portion of the above energy into direct current at tensions ranging from 110 to 190 volts. The general lighting of the park is effected by means of 450 arc lamps on various systems. For illumination of the buildings 40,000 incandescent lamps are employed. The exhibition is fitted up with a telephone service on the common-battery system, contributed by the Industrial Telephone Company.

The exhibits are grouped in four large buildings: the Power Building, the Grand Palace, the Palace of Mining and Transportation and the Palace of Agriculture.

QUESTIONS AND ANSWERS

EXPANSION OF ARMATURES

H. T., Chicago: Recently I got into a discussion on expansion of armatures while revolving and was told that the only thing that causes this was an increase of temperature. I contended that anything that revolves, whether cold or warm, would expand to a certain degree, as, for example, a flywheel on an engine. Am I not right on this point?

ANSWER

Any revolving object, such as a flywheel or an armature, is subjected to the action of centrifugal force, which puts a strain on those elements of the rotating body that keep it from flying to pieces. This strain is a slight elongation of these elements, if radial, or a slight distortion, if they are not strictly radial arms. There is also a very slight distortion of the circumference between the arms of the wheel or spider. If the wheel has a solid web, the distortion will be more uniform, but less in extent. In any case the result of this distortion is to cause a slight increase in diameter, or, as the correspondent says, a slight "expansion" of the rotating body. This expansion, however, is so small and so difficult to measure as to be practically inappreciable. In the case of an ordinary armature the expansion of the core due to heating is probably as great as that due to mechanical stress.

CHANGE OF FAN-MOTOR SPEED DUE TO CHANGE OF FREQUENCY

T. E. K., Spring Valley, Ill.: Why does a ceiling fan motor of a certain make and wound for 110 volts, 125 cycles, operate at about half speed on a 100-volt, 140-cycle circuit, while other makes of fan motors, likewise wound for 110 volts and 125 cycles, operate at about the same speed on either of these circuits?

ANSWER

In the case in question, the voltage is nearly 10 per cent. low and the frequency 12 per cent. high, both of which tend to cut the current down to such an extent that the motor will not pick up the speed it is designed for. There is no apparent reason why one motor should keep up to speed and another not do so when put on the higher frequency unless the conditions as to spread of the blades, etc., should not be alike on the two motors. In general, fan motors are designed for a particular voltage and frequency and will not work satisfactorily if these are changed. Some manufacturers claim, however, that their motors will operate satisfactorily at five per cent. above or below rated frequency or voltage.

INDUCTION COILS

C. B. H., Chicago: Why is it that induction coils are not generally built with a closed magnetic circuit, as transformers are?

ANSWER

A closed magnetic circuit makes a much more efficient induction coil or transformer, since the magnetic leakage is very small and therefore the necessary magnetizing current in the primary is small compared with that necessary for the ordinary open magnetic circuit induction coil. However, with the closed magnetic circuit there is more of a time lag between the cyclic changes in the iron and those of the primary current, and with high-frequency coils the magnetism will not die down with sufficient rapidity. Furthermore, the open magnetic circuit coil has but a bundle of iron wires, or even a still more simple solid core, and this simplicity and cheapness of construction account largely for its general prevalence.

The Houghton County Traction Company, capitalized at $2,825,000, has been organized by Stone & Webster for the purpose of taking over the Houghton County (Mich.) Street Railway Company and building the Wolverine to Mohawk extension.

HOLOPHANE "ARCS" WITH TUNGSTEN LAMPS

Official announcement is made by the engineering department of the National Electric Lamp Association that it is now safe and practicable to burn 40 and 60-watt tungsten lamps at an angle. With characteristic conservatism, the Holophane Company has waited for official sanction from the lamp engineers before recommending the well-known Holophane arc unit with tungsten lamps, although for many months it has been well known that these lamps could be so burned without danger.

HOLOPHANE "ARC" WITH BRASS STEM SUPPORT

So long ago as last May an installation of 13 No. 66 Holophane arcs was made in the Knox Five and Ten Cent Store in Bloomington, Ill. Three months later it was reported that not a single lamp had burned out, despite the fact that during one of the three months the lamps were in service two-thirds of the entire day, it being a very dark and rainy month. Similar installations were made by Mr. J. S. Maltman, of the Kankakee Electric Light Company, Kankakee, Ill., who states that he has had some 20 Holophane arcs equipped with 60 and 100-watt tungsten lamps in service for over three months and has not as yet found any trouble with these tungsten lamps burning at an angle.

With the sanction of the engineering department of the National Electric Lamp Association and the favorable experience of its customers, the Holophane Company is now recommending the Holophane arc for all classes of commercial services with tungsten lamps of the 40 and 60-watt sizes. Tests showing the distribution and efficiency of these units so equipped are now being made.

THE WORLD'S WATERPOWERS

In a summary of the waterpowers of the world from information collected by the Revue Electrique, the possible horsepower of France is estimated at 4,500,000, of which only 800,000 is utilized. About an equal amount of power is available in Italy, but only 30,000 horsepower is utilized. Falls of 10,000 horsepower are abundant in the Alps. The estimate for Switzerland is incomplete. About 300,000 horsepower is in use. Germany has 700,000 horsepower available, with 100,000 applied. Norway has 900,000 horsepower available, with a large part already developed. In Sweden there is 763,000 horsepower available, but mostly at a considerable distance from any industrial center. In Great Britain there is 70,000 horsepower already utilized, and an equal amount in Spain. The resources of Russia are estimated as 11,000,000 horsepower, of which 85,000 has been developed. The United States is credited with 1,500,000 horsepower in this estimate. Japan has 1,000,000, of which 70,000 has been exploited, and in the Indies 50,000 horsepower has already been developed.

CIGAR LIGHTERS FOR CONTINUOUS AND INTERMITTENT SERVICE

Cigar lighters for both continuous and intermittent service are now being manufactured by the General Electric Company in the pendant and desk or table types. These cigar lighters are suitable for operation on either alternating or direct-current circuits and may be readily connected to any ordinary lamp socket.

For intermittent service both the pendant and table types are available, but the pendant type only is suitable for continuous operation. Those for intermittent service are equipped with a push button for closing the circuit during the period of operation, which is generally from four to six seconds. The continuous-service lighters are normally left in circuit, but have a snap switch for turning the current off when not in use.

The heating unit is somewhat similar in appearance to the ordinary fuse plug. For intermittent service it consists of several lengths of coiled wire lightly cemented to a thin sheet of insulating compound. The ends of the wire are connected to terminal screws in the porcelain plug base, which is screwed into a socket in the body of the lighter. A thin piece of perforated mica placed in a metal cap fitted to the porcelain plug base protects the heating coils. To light the cigar or cigarette it is only necessary to place the end against the perforated disk, the hot air drawn through the holes in the mica igniting the cigar even before the mica disk becomes red. The intermittent desk type, as shown in the illustration, is compact and simple in design, the heating element being similar to that used in the intermittent pendant type.

Pendant Intermittent — Desk Type for Intermittent Service — Pendant Continuous

ELECTRIC CIGAR LIGHTERS

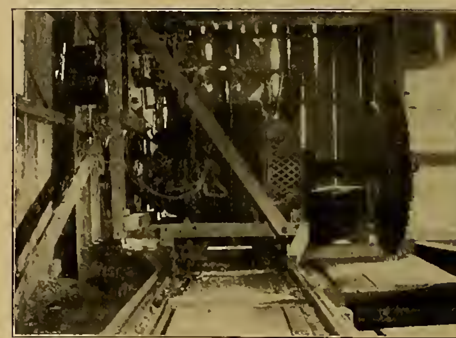
The construction of the plug for continuous service is similar to that for intermittent service, except that the coils of wire are completely filled with cement between turns. With this unit no mica covering is used, as a perforated insulating compound placed on the top of the heating unit conducts the heat to the cigar. As will be noted in the illustration, these plugs are surrounded by a perforated metal mouthpiece, which protects the plug and also prevents the liability of anyone being burned by coming in direct contact with the heating element. In this type of cigar lighter, the heating plug cannot be removed without the use of a special spanner. This feature is of special importance when the lighters are used in public places, such as hotels, cigar stores, etc.

These cigar lighters are made for voltages from 95 to 125 volts. Their power consumption is very low, being 75 watts for the intermittent type and 25 watts for the continuous type. The cost of operation and the life has been determined after a series of careful tests. It was found that with the intermittent type 1,000 lights could be obtained at an approximate cost of one cent where power is sold for 10 cents per kilowatt-hour. The continuous-service lighter can be operated at a cost of about three cents per day. The durability tests show that the intermittent type will give about 22,000 lights before deterioration of the heating element occurs. Tests now being conducted on the continuous-service types show a maximum of over 5,000 hours at the present time. These tests are still in progress, so that this value will doubtless be exceeded.

The work of railroad electrification is going on rapidly in China and Japan. Yokohama and Tokio have electric street-railway systems whose engineers and directors are all native Japanese. Hongkong and Shanghai have operated electric railways with success, the former, which is a British city, having built its tramways several years ago.

A CONTRACTOR'S ELECTRIC MOTOR

The adaptability of electric motors to all sorts of service is well illustrated in the two accompanying views of a direct-current motor used by a contractor working along the Ohio River. The motor only differs from a type "S" motor of standard Westinghouse design in that the shaft is somewhat larger and longer on the pulley end and that a commutator-end bracket is supplied on this end to provide a bearing nearer the saw. The motor speed may be varied from 1,125 to 1,800 revolutions per minute to provide for various classes of work, with saws of different diameters. This motor is rated at 10 horsepower.



CIRCULAR SAW DRIVEN BY 10-HORSEPOWER CONTRACTOR'S ELECTRIC MOTOR

It will be noted that a pulley has been installed on the extended shaft at the commutator end to act as a flywheel, and also to provide a place for a brake. This latter is thrown on by means of a lever near the operator whenever it is desired to stop the saw quickly. The contractor has also installed a bladed fan on the pulley to blow air over the motor and throw the chips and sawdust away from the track and the motor. These cannot be seen in the illustrations, however.

In one view a large circular rip saw is shown taking a cut in a heavy oak timber to be used in dam wickets on the river. The material must finish 10 by 12. Another view shows a groove cutter in place. A cross-cut saw is also used by the contractor who owns the outfit.

The motor is mounted on a frame with wheels which run on a short piece of track, that the saw may be fed through the work. A simple method has been adopted by the contractor to keep the track clear of sawdust. In front of all four wheels a flap of leather is arranged to rub on the track which effectually clears away all material and allows the groove cutter to make a cut of even depth at all times.

OPERATOR USING GROOVE CUTTER ON EXTENDED SHAFT OF CONTACTOR'S MOTOR

Mounted on the frame which carries the motor is the switchboard panel, with a field rheostat for adjusting the speed, a starting rheostat and a circuit-breaker. As the motor must move back and forth, the current is supplied through two short stretches of trolley wire on which the trolley wheels run, similar to the method used in a traveling crane.

From the illustrations it is apparent that the motor is not installed under ideal conditions, as the protection from the weather is none too good, but it shows to what purposes motors may be put. The entire outfit is intended by the contractor for portable service, as current is supplied from a gas-engine-driven generator, which is also mounted for ready handling.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, August 18.—Not long since, the postal and telegraph administration decided to commence installing improved telephone switchboard apparatus at the exchanges of Paris and in the leading cities of France. The first of these was erected at the Sablons exchange of Paris. Following this, a much larger switchboard is soon to be opened for use in the Gutenberg or main central exchange of the city, and it will probably commence operations on August 20th. On this occasion the telephone administration took additional precautions in order to have the system work in a satisfactory manner, and thus it will avoid the trouble which occurred in the Sablons exchange when the new switchboard in that station was opened last May. At that time the employes were not well enough versed in handling the new apparatus, and many were the complaints from the subscribers, who were deprived of the connection for some time. The administration recognized its errors on this occasion and is now taking measures to have the new service work in the best way. Accordingly the new switchboard has been carefully tested and examined in all its parts. The subscribers will be connected to it in small groups of 500 instead of being transferred from the old switchboard at once, and in this way there will be time to examine the connections of the lines. It took nearly two years to build the new switchboard, and it is designed to receive 10,000 subscribers.

The city of Toulon has been deprived of electric light in the streets for a period of several days. This is owing to a disagreement of a somewhat unusual nature between the city and the lighting company, which operates both the gas and the electric-lighting systems. It appears that the city owes a considerable amount to the company, and the latter accordingly decided to suppress the electric lighting until this was paid. This measure plunged the streets in darkness to a great extent, and only the gas burners are now lighted. The company now proposes to turn off half of the gas lamps as well. On the other hand, the Municipal Council is taking measures to make the required settlement.

The principal cities of Germany are now equipped with automobile fire pumps of different types, and this country is one of the farthest advanced in this direction. At present there are 27 cities which are using automobile pumps, and their use is constantly increasing. Throughout the empire there were at last accounts 54 automobile fire pumps, of which number the electric pumps take the lead with 24, while of steam pumps there are 20, and gasoline motor pumps 10. Owing to the increase which it is proposed to make in different cities, there will be a total of 71 automobile fire pumps by the first of the year, of which number there will be 40 electric-motor pumps. Berlin now possesses five electric fire engines, followed by Cologne, Hamburg, Munich, etc. The different types are built by the Krieger, Siemens-Schuckert, Braun and Lohner-Porsche companies, which are among the leading constructors. For private use, the Oerlikon Company is building a type of small-motor pump which uses a 15-horsepower motor and is built to work on direct or alternating-current circuits. The carriage work is of a light character and the apparatus is drawn by hand, being intended mainly for use in factories or other large establishments.

Berlin is to have a system of subway lines for carrying the mail between the main postoffice and the railroad depots. It will follow somewhat the underground lines which are in use in Chicago in the Illinois Tunnel Company's telephone tunnels. There will be two principal lines of subway built in Berlin for this purpose, but, unlike the Chicago system, the subway lines will be constructed especially for the mail cars. The latter will be of small size, and are to be driven by electric motors on an automatic system. One of the tunnels will run in a circular direction around the central part of the city and will connect the principal railroad depots, while the second line will run in a straight direction in order to join the two leading postoffices with the Potsdam railroad depot. The section of the tunnel for double track will be six feet in width by 2½ feet in height, and it will be laid under the streets near the surface.

NEW ENGLAND

Boston, August 29.—An event of interest to local traction men was the visit to the city last week of the street-railway committee of the Philadelphia City Council. The party was entertained at luncheon by the mayor and met Vice-president Sargent and other officials of the Boston Elevated Railway system in conference for a couple of hours, later making a tour of the city in the private car of General William A. Bancroft, the president of the road. The committee has visited Pittsburg, Detroit, Cincinnati, Milwaukee, Cleveland and Buffalo and left this city for New York. They were especially interested here in the transfer systems in use both on the cars and at transfer stations in the subway and at the terminals, where the surface and elevated lines come into stations used in common and passengers transfer at will without the use of checks.

The dispute between the railway and the city government of Cambridge over the number of stations in the subway from Boston to Harvard Square having been settled, with a decision in favor of three stopping places, the building of the tunnel will soon commence. Work on the completion of the plans in accordance with the decision is now under way.

Leavenworth Wheeler, who has been superintendent of the Berkshire Street Railway Company for a numbr of years, has been appointed engineer of maintenance of the New England Investment and Securities Company, which controls electric roads and other properties that were absorbed and amalgamated in the interest of the New Haven road. He will be a member of the general executive staff and his headquarters will be in Springfield.

The Postal Telegraph Company has filed a bill in the Supreme Court of Massachusetts seeking to have the city of Worcester enjoined from compelling the company to remove poles and wires and place its wires underground in certain streets where the city has directed such disposal of them. The company questions the constitutionality of the act under which the city makes this requirement, stating that it is an illegal discrimination against the company and an unwarrantable interference with interstate commerce as well as an impairment of contract without compensation therefor. The matter comes up September 7th.

Close upon the summary of its showing for the six months ending June 30th the American Telephone and Telegraph Company makes public its exhibit for July and the seven months' period, inclusive of that month. July net earnings were $3,643,909, an increase compared with July, 1907, of $305,951, or upward of 9 per cent. It appears that the company in seven months has practically earned the full year's dividend, reckoned at 8 per cent., on the $152,484,855 outstanding capital stock.

James L. Richards, who is president of the subordinate gas-light companies of the Massachusetts Gas Company, operating in Boston and vicinity, and of a number of the subsidiary railway lines controlled by the Boston Suburban Electric Companies, has filed with the Massachusetts railroad commissioners this week a petition for authority to consolidate three of the railway lines in the group. The plan contemplates the absorption of the Westboro and Hopkinton, capital $40,000, operating 6.37 miles of road, and the Natick and Cochituate, capital $100,000, operating 26.48 miles of road, by the Middlesex and Boston, capital $300,000, operating 15.9 miles of road, the name of the latter company to be retained and the exchange of stock to be at par. Whether this is the extent of the consolidations planned is conjectural at present. Mr. Richards is one of the progressive younger group in Massachusetts' financial affairs, and this movement possibly paves the way for a union of all the companies under the control of the Boston Suburban Electric Companies, including the Lexington and Boston, the Newton, the Newton and Boston and leased lines of the latter two systems.

The mayor of Boston has announced his intention to ask the next state Legislature to reduce the number of members of the Boston Rapid Transit Commission from five to three, as the work of the board is drawing to a close with the completing of the Boston tunnel. Meanwhile he defers the appointment of a successor to the late Thomas J. Gargan.

The Southern New England Telephone Company, the American company's subsidiary in Connecticut, has announced a lower schedule of rates for individual-line residence telephones in Hartford, New Haven, Bridgeport and Waterbury, the reduction bringing the charge down from $48 to $36 per year in the first three cities and from $40 to $36 in Waterbury. The purpose of the change is to increase the use of individual rather than party lines, and to forestall Independent telephone competition.

On August 25th the New England Street Railway Club went to Norumbega Park, in Newton, about 200 members and their friends being the guests of the president, Matthew C. Brush, and of the Newton Street Railway Company, owner of the park. Mr. Brush is the general manager of the railway. B.

NEW YORK

New York City, August 29.—Bion J. Arnold of Chicago, consulting engineer of the New York Public Service Commission, in a fifth report on the study of the question of cooling and ventilating the Subway, makes several important recommendations, chief among these being that a four-inch terra-cotta block wall be built between the two express tracks, which virtually would make a double tunnel. This recommendation the engineer bases on the theory that with trains running by each other in rapid succession the superheated air of the Subway is simply churned and whipped about, and remains in the Subway instead of being driven out by the fans through the automatic shutter arrangements placed in the ventilating chambers between stations. The temperature of the Subway has been found to be several degrees above the outside street temperature, and the cause of this heat may be well understood when it is remembered that a large part of the electrical energy transmitted from the power house, thousands of horsepower, eventually goes to raise the tunnel temperature, either from the heating of wires, resistances and motors, or later from the brake-shoes and car friction. During the summer months about one-fifth of the heat, using the air as a carrier, passes out through the openings along the Subway into the street, the other four-fifths tending to escape through the sides and bottom of the Subway.

The adoption of electricity as motive power by several of the large railroads has been keenly felt by the soft-coal operators of late. Those who operate in the bituminous fields of Pennsylvania say that the constant growth of electricity as a motive power has cut large holes in the profits of the coal men and that the general business depression is not entirely to blame for the present bad business in the bituminous fields. They say that during the last two years shipments of bituminous coal have been steadily decreasing, and that if there was ever any belief in this country that the coal veins would be exhausted soon that fear has surely passed away.

The receivers of the Metropolitan Street Railway joined issue finally with the Public Service Commission at Wednesday's hearing on the Fifty-ninth Street transfer question and served formal notice on the board that they are prepared to challenge its jurisdiction over the rates and routes of street railroads of the city, although expressing their willingness to furnish any information with regard to the property in their charge which the commission may require.

From this it appeared that if the commission should issue an order setting up a through route between the Fifty-ninth Street line and the lines of the Metropolitan between Thirty-fourth and One Hundred and Sixteenth streets there will be a conflict in the courts. The commission holds that it has no choice under the statute but to set up through routes and fix rates, and will proceed to comply with the law. The receivers will then, unless they see reasons to change their policy, attack in the courts the constitutionality of the commission's position.

The electrical workers' union has taken out an injunction against the officers and members of the Electrical Contractors' Association restraining them from employing members of any but members of the New York Electrical Workers' Union.

The Public Service Commission has approved a change in the plans of the City Hall station of the Brooklyn Loop Subway, which will be in the basement of the new municipal building in Tryon Row. There are to be six tracks instead of four, as at first proposed, and they will be depressed eight feet below the original plans. Access to the island platform is to be by stairways from a mezzanine floor, as at Fourteenth Street and Grand Central stations of the present subway, and the idea of building a tunnel under the tracks with escalators to carry the passengers up to the platforms has been given up. The abandonment of the escalators will save $85,000, but it will be necessary on account of the depression of the tracks to shift a large sewer to another street at a cost of $125,000.

OHIO

Toledo, August 29.—One of the busiest concerns in the city next week will be the Toledo Railways and Light Company. Extensive preparations have been made to care for the multitudes of people who are expected to attend the encampment of the G. A. R. Schedules have been changed on nearly every line, and three and four-minute cars will be running in every direction, while owl cars will be supplied for night service. Every piece of rolling stock has been fitted up and put in service, and a large number of cars have been borrowed from other lines for the week. No chartered cars will be furnished to anyone. In addition to its heavy railway operations, the company has made extensive provision for extra lighting, signs and displays of all kinds throughout the city. The biggest business in the history of the company is predicted.

The Power Truck and Tractor Company was incorporated this week at Toledo by Dr. David S. Brown, C. S. Davis, Whitney C. Norton, A. W. Clark and Fred A. Brown. The company has a $50,000 capital stock and will manufacture and place on the market a power truck, the invention of A. E. Zock of Cleveland. The machine will be both shaft and chain driven, and the power applied to both front and rear wheels.

Two more large petitions were presented to the City Council of Lima, Ohio, protesting against the building of a city electric-lighting plant, for which bonds amounting to $100,000 were ordered sold last week. Mayor Becker has signed the ordinance and the building will soon be under way. Three propositions for cheaper lights have been submitted by the Schoepf syndicate, all of which were rejected. The company's franchise does not expire for about two years yet. H. L. S.

INDIANA

Indianapolis, August 29.—The Valparaiso and Northern Railway Company, recently incorporated, will construct, maintain and operate street and interurban railroads in Northern Indiana. Its lines will run from Valparaiso to and in the town of Chesterton, Porter County. The following Chicago capitalists are back of the enterprise: George G. Pfleger, L. E. Woodard, D. R. Chase, M. J. Cook and W. R. Watson. The company's headquarters will be in Valparaiso.

Electric-railway service between South Bend and Laporte and intervening points was commenced on the western extension of the Chicago, South Bend and Northern Indiana Railway on the 20th inst. Cars make the trip every two hours. The completion of this extension gives the Murdock syndicate a continuous line from Goshen through to Michigan City.

General Manager A. A. Anderson of the Indianapolis, Columbus and Southern, and the Indianapolis and Louisville traction companies, with headquarters at Columbus, has made 16 different possible schedules for the new limited service about to be inaugurated between Indianapolis and Louisville. It is the purpose of the officials to make this the fastest and most convenient interurban service in the country.

It is announced that more than $50,000 has been subscribed toward the building of a new traction line from Southern Indiana to Olney, Ill. The company back of the project hopes to have $250,000 subscribed before work on the line begins in the early spring.

The Central Electric Traction Association's interchangeable mileage ticket, on sale September 10th, will enable travelers to ride over nearly all of the traction lines in Indiana and Ohio.

The Morgantown Light and Power Company has filed articles of incorporation, with the declared purpose of constructing and equipping an electric-lighting plant at Morgantown. The directors are William T. Gibson, Jesse Deer, James A. Collett, Jos. H. Enos and W. W. Davis.

The Pleasant Shades Power Company, with headquarters in Crawfordsville, has incorporated with a capital stock of $100,000. The company proposes to construct dams and reservoirs for the purpose of furnishing electric power, light, etc. The directors are Isaac E. Ewers, Henry D. VanClark and M. E. Ewers.

C. M. Poor, superintendent of the Clinton Electric Light Company, has caused the arrest of a number of patrons of the plant on a charge of altering their electric-light meters.

The Taylorsville telephone plant at Taylorsville, Ind., has been purchased by Harris B. McEvenue, Albert Miller and Harry H. Brown. The new owners propose making extensive improvements in the plant and extend the line into new territory.

The commissioners of Allen County have granted a new franchise to the Citizens' Telephone Company of Decatur. The fact that the company was obliged to move its wires and poles from near the Fort Wayne and Springfield interurban line, because of induction which rendered the transmission of messages impossible, necessitated the company securing a new franchise to construct and operate its lines in a new location.

The appointment of a receiver for the Central Home Telephone Company of Louisville, upon application by bondholders and creditors, is of considerable importance to the Independent telephone companies of Indiana. The company owns all the Independent long-distance lines, radiating out of Louisville, and extending to all parts of Southern Indiana. It was represented to the court that the company had outstanding $5,000,000 of stock and $2,000,000 of bonds, and, in addition, it had outstanding about $100,000 in current debts.

Edward L. Cline, who has removed to Indianapolis, having succeeded J. E. Brailey as general manager of the Indianapolis Telephone Company, will continue as the general manager of the Independent telephone company at Toledo, dividing his time between the two cities.

The Central Union Telephone Company is sending out circulars advocating the desirability and economy of maintaining a single telephone system in Indianapolis, stating that it has offered to purchase the Indianapolis Telephone Company's plant for $750,000, a sum in advance of its cost, and promises to serve the entire city under a new limited franchise at reasonable rates. The company claims to be the largest exchange in Indiana—having nearly 14,000 telephones in service in Indianapolis—and by the expenditure of a very small sum would be able to connect with and serve every telephone user in Indianapolis. Indianapolis is the geographical center of the Central Union district including Ohio, Indiana and Illinois. S. S.

ILLINOIS

Peoria, August 29.—The Alton, Jacksonville and Peoria Railway Company has certified to an increase in capital from $800,000 to $2,000,000.

The American Lockout Telephone Company of Olney has increased its capital from $5,000 to $10,000.

The Consolidated Railway Company of Springfield expects to receive the new sprinkling car soon. It was ordered after the company had received the new franchise, and it will be operated over the business sections of the city three times daily and twice over the residence sections.

The Peoria Gas and Electric Company is extending the steam-heating mains a distance of two blocks in order to serve some new business that has been secured. The work is being done in the best manner, using eight-inch pipe covered with asbestos and the large wood log, together with the expansion joints and service outlets. V. N.

NORTHWESTERN STATES

Minneapolis, August 29.—George P. Sadler, civil engineer, has been making an estimate of the cost of construction and operation of the Maquoketa-Clinton interurban route between Clinton and Cascade, Iowa.

The Iowa Interstate Railway Company of Des Moines, Iowa, has been organized with $10,000 capital. R. B. Bannister is secretary and treasurer. The line is intended to run between Council Bluffs and Muscatine, via Des Moines.

W. S. Cook, contractor and builder of interurban railways, of Pennsylvania, is interested in a proposed line between Sioux City and Council Bluffs, Iowa.

The survey for the Iowa Railroad, between Eldora and Boone, Iowa, has been completed.

The Iowa State Railroad Commission is considering the passenger and freight rates instituted by the interurban railroads of that state.

At Stewartville, Minn., the building in which the light plant is located was totally destroyed by fire. Work was immediately started to get the lighting machinery, which was not much damaged, in running order again.

H. C. Huebner of Albert Lea, Minn., who is interested in the Marquette, Negaunee and Ishpeming Railway Company, expects to start active work on the right-of-way within a few weeks.

An electric road from Livingston to Billings, Mont., is proposed, and $1,000,000 worth of bonds will be issued for the purpose. The Billings and Eastern Montana Power Company, the Madison River Power Company and the Butte Electric and Power Company are behind the project.

The City Council of Grand Forks, N. D., passed the amended street-railway ordinance granting a franchise to Messrs. Lander, Webster and others. Plans are being made to hurry the preliminary work.

The Sturgis Light and Power Company of Sturgis, S. D., is installing a new engine to furnish power for a daylight service.

In the action of the Dells Improvement Company and the Dells Paper and Pulp Company against the city of Eau Claire, Wis., the city has amended its answer so as to include the Chippewa Valley Railway, Light and Power Company as a party in the action. The action is to test the validity of a contract made in 1877 and a 99-year lease.

The municipal electric-lighting plant at Reedsville, Wis., has been closed, after several unsuccessful attempts to operate it on a paying basis.

The Calumet Service Company of Oshkosh, Wis., was organized for the purpose of taking over the lighting plant at Chilton, Wis. It is proposed to repair the plant, which has not been running since last January, and put it in first-class shape.

The City Council of Dodgeville, Wis., has served notice on the electric-light company that if it wishes to occupy the city power house temporarily it must pump the water, light the streets and keep the machinery in repair without cost or expense to the city.

The Northwestern Telephone Exchange Company has started work on a system of underground work for the business section of Grand Forks, N. D. All wires in the fire district are to be placed in conduits.

The Northwestern Telephone Exchange Company will oppose any attempt on the part of the city councils of either Minneapolis or St. Paul to regulate or lower the rates being charged for telephone service. There are ordinances pending before the councils of both cities to make the maximum charge for business service within the downtown district $48 per annum, instead of $84, as it now is in some cases.

An ordinance has been passed at Oelwein, Iowa, fixing the rates for residences at $1 per month and for business houses $2 per month. R.

WESTERN CANADA

Winnipeg, August 29.—At the last meeting of the City Council at Nelson, B. C., Alderman Stead gave notice that at the next meeting he would introduce a motion to provide for an additional unit at the civic power plant at Bonnington Falls.

The total number of passengers carried by the British Columbia Electric Street Railroad Company on its Vancouver lines during the year ended June 30th was 14,305,422 and 4,273,841 on its Victoria lines during the same period. During July of this year the Vancouver lines carried 1,532,062 passengers, against 1,270,019 during the same months a year ago.

The ratepayers of Edmonton, Alb., voted in favor of purchasing the charter of the Strathcona Radial Tramway Company for $10,000. This company proposed to operate a street-railway system in the city of Strathcona, but the Edmonton authorities were of the opinion that a single system to cover the two neighboring cities could be operated to better advantage than a dual system. The ratepayers, by a majority of 710 to 7, also voted in favor of borrowing $135,000 to complete the municipal street-railway system in Edmonton.

Contracts have been awarded by the City Council of Edmonton, Alb., to the Canadian General Electric Company, Peterboro, Ont., for motors in connection with the municipal street-railway system now being constructed. The cars will be built by the Ottawa Car Cmpany, Ottawa, Ont. These cars will be vestibuled, and seven of them will seat 40 people, while the four cars to be used in the sister city of Strathcona will seat only 32 people and have two-motor equipment and single trucks.

The plans prepared by Cecil B. Smith for a dam at the power station to cost $40,000 were rejected by the City Council of Port Arthur, Ont., and he was instructed to prepare plans for a dam to cost not more than $8,000. Address J. McTeigue, city clerk.

The province of Saskatchewan has lost no time since the organization of the Department of Telephones and Telegraphs in carrying out its plans for a complete telephone system throughout the province. The government's telephone legislation only became law two months ago, and already contracts have been let for the building of over 400 miles of long-distance lines and all the necessary material for the construction of these lines has been ordered by the department, as well as the supplies for additional lines, the contracts for which have not yet been let. In addition to the government lines, several dozen rural companies have been organized or are in course of formation throughout the province. The contract for the building of the Lumsden-Saskatoon line, a distance of 180 miles, has been let to J. S. Bartleman of Regina, Sask., at $79.75 per mile. Prices for the construction of this line ranged from the price of the awarded tender to $120 per mile. The line to connect Regina and Antler, a distance of 220 miles, has been let to the Moosejaw Telephone Company, Moosejaw, Sask., at $79.50 per mile, the tender of J. S. Bartleman being 25 cents per mile higher. From Antler a couple of miles of line will be built to connect with the Manitoba government system at Sinclair, arrangements having already been made with the Manitoba Telephone Commission. The poles for the lines will all be 25 feet in length, while those in the northern portion of the province will be somewhat heavier than those in the south. All wires strung will be of copper, two wires to each line. The wire to be used is that known as No. 10 New British Standard, and weighs 262 pounds to the mile for each individual wire, and is of the same quality as that used in the long-distance line between Winnipeg and Regina, one of the best lines built by the Bell company in Western Canada. It is the intention of the government to establish toll stations along the routes of the lines at places where there is not already a telephone system or where the system is owned by the Bell. The supplies are already beginning to arrive and construction work will be commenced on these lines as soon as the railroad companies can deliver the poles.

To add to the complications of the power situation at Winnipeg, Man., the Great Falls Power Company has made an offer to the provincial government to supply power at $12 per horsepower and suggests that the government go into the power business in the same way as is being done by the government of Ontario. H. M. Byllesby & Co. of Chicago are acting with the Great Falls

Power Company, and their solicitors state they are prepared to enter into a contract with the Manitoba government to supply from 30,000 to 100,000 horse-power from a power house to be erected on the Winnipeg River, some 65 miles to the north of the city of Winnipeg. The power is to be charged for according to the measurements on the generator side of the switchboard, and for this rate the company would require a 40-year contract with the government. The company would reserve the right to sell any surplus power, providing it did not enter into competition with the government. Accompanying the offer from the company was a letter from Charles Chamberlain, pointing out the advantages of the scheme, and suggesting that the pole lines used by the Manitoba government telephones could also be used for transmitting the power to various parts of the province. In the event of the Manitoba government accepting this proposition it would mean an end to Winnipeg's scheme to develop power from the same river, despite the fact the city has already expended $319,000 on the development and is preparing to spend an additional $3,000,000. So far the matter has not been laid before the Winnipeg City Council, the correspondence having only just come to hand. R.

PACIFIC SLOPE

San Francisco, August 26.—The report is current in financial circles here that work is to be resumed on the plans of the Stanislaus Electric Power Company for a large power plant on the Stanislaus River to cost in the neighborhood of $250,000. This company was financed by the Knickerbocker Trust Company of New York and work on its plant was suspended at the time of the failure of that company last fall. It is now alleged that the company has passed into the hands of the owners of the United Railroads of San Francisco, who will complete the work of the power company and use the current developed for the operation of the company's street-car lines in San Francisco. It seems certain that some sort of negotiations are under way between the owners of the two companies, and electricians are agreed that unless the power company can secure a contract with the railroad company or some other large consumer, the power plant on the Stanislaus will not be rushed to completion.

W. H. Hatton of Modesto, Cal., acting for the La Grande Water and Power Company, has applied to the City Council of Turlock, Cal., for a franchise for an electric-lighting and transmission system in Turlock. The franchise asked for will be offered for sale on October 3d.

Advices from Fresno, Cal., state that the Kings River Power Company of Los Angeles has filed notices of appropriation of water in the various forks of Kings River totaling 120,000 inches. This consists of appropriations of 40,000 inches each at three different points.

Col. J. E. Fulton has filed a claim to the use of the waters of Kelsey Creek, near Kelseyville, Cal., for electric power purposes. The current developed will be used in the operation of an electric railroad connecting Kelseyville, Lakeport and Upper Lake.

Walter Coggeshall, of the Coggeshall Launch Company, Eureka, Cal., is to erect a gasoline power plant at a point near Eureka to supply illumination and power for an amusement park.

Bids will be received by the board of managers of the California State Hospital at Agnews, Cal., for a power plant and conduit system for the state institution.

C. S. Chestnut of Redlands, Cal., has applied for a franchise for an electric transmission system along certain roads and streets in San Bernardino County.

The Octave Mining Company is preparing to install a power plant at the town of Wickenburg, Ariz., to be used in supplying the town and neighboring mines with light and power.

The Mount Whitney Power Company is now assembling the material for its flume near Porterville, Cal. Thirty-five carloads of lumber and other materials are now being taken from Porterville to the site of the flume at the forks of the Tule River.

The Pacific Gas and Electric Corporation of San Francisco has secured from the Board of Public Works of Oakland, Cal., a permit for a corrugated-iron addition to its power plant on First Street, Oakland, at a cost of $35,000. In the addition a 9,000-kilowatt steam plant will be installed. The installation is to be completed in time to be ready to help out during the winter months, when the long-distance transmission lines are liable to accidents.

An electric power plant is to be installed at the Gray Eagle mine, near Downieville, Cal.

An ordinance providing for the issuance of bonds to the amount of $500,000 for the purpose of completing the extensions to the municipal lighting system has been passed.

The Lebanon Electric Light and Water Company has been incorporated at Salem, Ore., with a capital stock of $25,000 by S. P. Bach, Samuel M. Garland, J. C. Mayer, P. M. Scroggin and S. I Stewart.

The Napa and Lakeport Railroad Company has been incorporated at San Francisco with a capital stock of $2,000,000 for the purpose of building a railroad from Napa to Lakeport, Cal., a distance of 90 miles. Either steam or electric power may be used.

The Nooksack Valley Traction and Railway Company has put a force of surveyors at work on the line of its proposed railroad between Bellingham and Blaine, Wash.

A. D. Schindler, general manager of the Northern Electric Company's electric railroads, states that the company will begin construction within the next few weeks on the 41-mile extension from Chico to Red Bluff and on the 22-mile extension from Marysville to Colusa.

At a meeting of the directors of the Redlands Central Railroad Company in Redlands, Cal., the former officers resigned and were succeeded by others representing H. E. Huntington, the new owner of the road. The new officers are: President, Howard E. Huntington; secretary, George C. Ward, and treasurer, E. T. Cook.

Property holders in the northeast section of Pasadena, Cal., have agreed to raise $45,000 as a subsidy, and the H. E. Huntington interests will build an electric railroad on Lincoln Avenue to the city limits.

The Los Angeles-Pacific Railroad Company has obtained a 40-year franchise for an electric street railroad in Santa Monica, Cal.

The Western Pacific Railroad Company is installing a block-signal system on the completed portion of its road in this state.

A. V. Bullion, superintendent of public utilities, Seattle, Wash., has filed formal charges against the Sunset Telephone and Telegraph Company and the Independent telephone company, asking the revocation of the franchises held by both companies on account of violations of the terms of these franchises.

City Engineer Hoxie of Fresno, Cal., estimates the cost of installing 218 electroliers for the proposed street lighting and the necessary ornamental poles at $28,939. A.

PERSONAL

Mr. James McMillan Smith, vice-president and general manager of the Southern Michigan Electric Railway, and formerly George M. Pullman's private secretary, was overcome with gas at South Bend, Ind., when working on an invention. He is recovering.

George M. Burpee of Manchester, N. H., chief electrical engineer of the Manchester Street Railway Company, was taken suddenly ill on a train while traveling from Manchester to Boston on August 26th, and died just before reaching the station in Boston.

Mr. William J. Crumpton has been placed in immediate charge of the Chicago office of D. C. and William B. Jackson, engineers. This office, which is located in the Commercial National Bank Building, will be the only western office of the firm, that at Madison, Wis., having been recently removed to Chicago. The Messrs. Jackson will devote most of their time to the work in the Boston office.

Mr. Charles H. Adams of Portland, Me., superintendent of the Maine division of the New England Telephone and Telegraph Company, was stricken with paralysis while at New Britain, Conn., on August 27th, on an automobile trip from New Haven to Boston, and was taken in a critical condition to the general hospital in that city. His wife and other relatives were in the touring car with him. He had just stopped to repair a punctured tire when overcome by the shock.

Mr. Henry K. Hudson, an Englishman, who is connected with the government telegraph lines in China, is in America studying the telegraph service of the United States. "The Chinese," says Mr. Hudson, "are extending their telegraph system to every corner of the empire, and Pekin will soon be in communication with all of the principal cities of Mongolia, Turkestan and Tibet, as well as those of China proper. The wires are being erected and operated by Chinese. The telegraph system of the empire is under the direction of Mr. Long, a Yale graduate. It looks a little odd to see a Chinaman at a telegraph key, and people wonder how they are able to communicate by wire in their own language. But the process is very simple. They use a phonetic system based upon the Morse code and wire the syllables as they sound to the ear, without using an alphabet in the Chinese language."

ELECTRIC LIGHTING

Shepherd, Mich., has voted bonds for $20,000 for a waterworks and electric-light plant.

The electric-light service at Gatun, Canal Zone, Panama, was begun August 1st. When the installation is completed about 1,000 lights will be in use.

The Farmers' Milling Company proposes to install an electric-light plant at Cold Springs, Minn.

Sherman, Tex., is considering a $15,000 issue of bonds for the improvement of the electric-light plant.

The Aberdeen Engineering Company may put in an electric-light and power plant at Redwood Falls, Minn.

The Arkadelphia (Ark.) Electric Light Company has been incorporated with a capital stock of $25,000.

ELECTRIC RAILWAYS

The Kansas City and Springfield Southern Railway is to put in a power plant at Arcola, Mo.

The Ocean Shore Railway Company plans an elevated entrance into San Francisco over a viaduct giving access to Market Street.

H. E. Bucklen of Chicago and Elkhart is preparing to electrify the St. Joseph Valley Railroad from Middlebury to Elkhart, Ind. Later extensions may include Kalamazoo, Mich.

The Cairo (Ill.) Electric Traction Company and the Cairo City Gas Company have been bought by the McKinley Traction System. The new owners now control all the public lighting and traction facilities of the city.

The Chicago, Wheaton and Western Railway Company has been organized with $10,000 capital stock, the incorporators being J. S. Condit, J. B. Strickland, D. W. Peters, R. B. Tabor and H. C. Wood, al of Chicago. The road will be an electric line connecting with the Aurora, Elgin and Chicago Railroad and branching out in the neighborhood of Wheaton and West Chicago, Ill.

Frosted lamps at the side of each seat is an additional convenience for the Chicago newspaper-reading traveling public in the new order of 680 "pay-as-you-enter" cars for the Chicago Railways Company. The aisles and seats will be extra roomy and all handle-grips and fittings will be of sanitary construction in which brass has been avoided on account of its germ-collecting properties. Each car is equipped with four inter-pole motors of 160-horsepower capacity.

POWER TRANSMISSION

The Empire Electric Power and Supply Company has purchased and will develop waterpower properties near Carthage, Mo.

Plans for a 30,000-horsepower hydro-electric development on Coosa River, at Lock No. 2 of the Coosa River Electric Power Company, are being prepared by the Solomon-Norcross Company, engineers, Candler Building, Atlanta, Ga.

The Backus-Brooks interests at International Falls, Minn., are reported to have sold their water-power interests there to eastern capital and it is understood that the development hereafter will be by capital furnished by the steel interests. It is further announced that work will begin at once looking to the completion of works that will produce 30,000 horsepower within a year. This will be followed by the quick completion of some new railroad lines in that district. The Backus-Brooks Company will complete a mammoth paper and pulp plant on the American side at International Falls, and the Ogilvie Milling Company of Winnipeg is to build a flour mill with a capacity of 20,000 barrels a day at Fort Frances, on the Canadian side.

TELEPHONE

At Wahoo, Neb., the Golden Rod Telephone Company has been incorporated with a capital stock of $100,000.

The Montezuma County Telephone Company of Cortez, Colo., has been incorporated with a capital stock of $15,000.

Premier Scott of Saskatchewan has announced that the government will purchase the Bell telephone system in that province.

Walter J. Mathewes, Oakland, Cal., architect for the United States Immigration Station on Angel Island, in San Francisco Bay, will receive bids until September 9th for an intercommunicating telephone system and other improvements at the station.

The formation of a merger company in Ohio is expected soon, to purchase the properties of the United States Telephone Company, the Cuyahoga Telephone Company of Cleveland and the Citizens' Telephone Company of Columbus. The United States Telephone Company, operating long-distance wires, is capitalized at about $4,000,000. It operates over 12,000 miles of wires connecting 300,000 Independent telephones and controls nine local companies. The Cuyahoga company is capitalized at $3,000,000, and the Citizens' company of Columbus at $700,000.

"Arrangements have been made for establishing direct communication by telephone between Paris and Cologne. The work will be begun at once."—European clipping. It is 250 miles from Paris to Cologne.

PUBLICATIONS

The Kimble Electric Company, 617 West Adams Street, Chicago, has issued a new catalogue and price list of its Kimble variable-speed alternating-current motors, forge blowers and ventilating fans.

Bulletin No. 22 of the Krantz Manufacturing Company, 160 Seventh Street, Brooklyn, N. Y., relating to the Krantz type PC knife switch, will be ready shortly. Meanwhile the company is sending out cards with description and quotations.

A "Bibliography of Electrochemistry and Allied Subjects" has been prepared by P. F. Mottelay as a 28-page pamphlet that constitutes Appendix I of his "Bibliographical History of Electricity and Magnetism," which will shortly appear in book form.

A complete description of the sewage-pumping station at Thirty-ninth Street and the Lake, Chicago, with illustrations of the centrifugal pumps installed, are given in Allis-Chalmers Company's bulletin No. 1611, a copy of which can be had upon application. This station has a capacity for pumping 2,160,000,000 gallons of water and sewage per day and has made an excellent record since its installation.

The American Steam Gauge and Valve Manufacturing Company's catalogue of steam-engine and other indicators gives a complete description of the large line of steam, gas, locomotive and ammonia indicators, with fittings and appliances, made by the company, besides containing useful information on the operation and testing of indicator apparatus. The company's main offices are at 208-220 Camden Street, Boston, Mass.

Two new bulletins on recording thermometers, Nos. 91 and 93, have just been issued by the Bristol Company, Waterbury, Conn. These bulletins, together with No. 92, cover the Bristol line of recording thermometers for all temperature ranges up to 800° F., the most complete list of such recording instruments in the world, the maker says. The Bristol Company also manufactures the William H. Bristol electric pyrometer.

"The Way to Forget" is a little preachment on the art of self-composure that almost recalls the style of Elbert Hubbard, but was written by Jay Wellington Hull, and is published by the Triumph Electric Company, Cincinnati. Its lesson is the economy of first-class equipment which will operate without chance of failure, enabling the busy man to forget its existence as far as worry over repairs is concerned. The treatise ends with a moral on motors.

WIRELESS COMMUNICATION

A party of government wireless-telegraph engineers left the Mare Island (Cal.) Navy Yard last week for Alaska, where they will establish a new wireless station near Valdez. This will be the last of a chain of stations established at intervals of 200 miles along the coast from Point Loma, near San Diego, to Alaska.

The French Academy of Sciences suggests an international arrangement whereby special wireless signals could be sent from the Eiffel Tower precisely at midnight, Paris time, and this signal, being received upon ships far out at sea, would furnish navigators with an invaluable check upon their chronometers by giving them the exact hour at a known point on the earth.

In a letter to the editor of the London Times, regarding the published accounts of the long-distance wireless telegraphic communication attained by the British ship Indomitable on her voyage to and from Canada, Mr. Marconi writes in part: "Might I venture to point out through your columns that it would have been impracticable for his Majesty's ship Indomitable, or any other ship similarly equipped, to have kept in regular wireless communication the whole way across the Atlantic, had not use been made of my company's high-power stations, situated at Clifden, in Ireland, and at Glace Bay, in Canada. My company was specifically requested by the Admiralty to send the long-distance messages to his Majesty's ship Indomitable. * * * I merely mention the above, as, although wide publication has been given in the press to the fact that wireless telegraphy has played an important part in maintaining communication between his majesty's ship Indomitable and the shore, in none of the statements that I have seen has mention been made of the system which has rendered it possible to effect this communication."

TELEGRAPH

The Postal Union Telegraph Company is building a line from Reno, Nev., to Goldfield, via Tonopah, From Reno it will be extended over the mountains to Sacramento and San Francisco.

The fiftieth anniversary of the laying of the first Atlantic cable in 1858 is celebrated this year, and this fact has been recognized by the management of the New York Electrical Show to be held next month, which will make an appropriate historical display that should prove to be interesting.

MISCELLANEOUS

Fire which started in the third floor of a building at 60 West Van Buren Street, Chicago, occupied by the Harvard Electrical Company, caused $5,000 loss.

An anonymous gift of half a million kronen (about $100,000) has been made to the Vienna Academy of Sciences for the establishment of a "Radium Institute" in connection with the new physics laboratories of the University of Vienna.

Industrial conditions that existed in the United States a short time ago apparently have not been confined to American soil. In a consular report the statement is made that over a thousand employes of an electrical engineering works at Loughborough, Leicestershire, England, have been discharged during the last three months, and the weekly wage list has been reduced from $12,000 to $7,000.

The annual sale of electrical insulated wire in Japan amounts to about $8,000,000. Of this, $5,000,000 worth is imported from abroad. It is admitted that the imported wire excels the home-made in quality, and is generally used in warships, steamers, and also for underground work. The art of electric-wire manufacture has made rapid strides in Japan of late years, and this, coupled with the ample supply of cheap copper, has reduced the cost of production so as to permit a price considerably below that of the imported product.

TRADE NEWS

The Sheldon School of Salesmanship, Chicago, Ill., reports a steady increase in its enrollment among representatives of the sales departments of electrical manufacturing and supply houses. All who have taken the course on salesmanship declare they have been much benefited in selling ability thereby.

Increases in freight rates are affecting the southwestern states perhaps more than others. Rates from St. Louis and vicinity to Texas, for example, have been raised from 5 to 15 per cent. Among the commodities to feel the effects most are telephone and telegraph poles, conduits, arc lamps, carbons and graphite.

The American Circular Loom Company, Boston, Mass., announces that its new circular-loom factory at North Cambridge, Mass., equipped throughout with modern improved machinery, is now in full operation, and that orders for circular loom will be filled promptly. The well-known high standard of the product will not only be maintained as in the past, but will be heightened by the new methods and means of manufacture.

The Central Electric Company, Chicago, reports that its incandescent-lamp sales for the first half of the present year are more than double the sales for the corresponding period of 1907. This the company attributes partly to the fact that it carries a good Chicago stock for immediate shipment of all standard voltages and candlepowers of high-efficiency units such as Columbia tungsten and tantalum lamps, as well as Columbia carbon-filament lamps, and partly to the superior quality of Columbia products.

The Wall Street Journal says: "From an industrial standpoint there will be few bond, stock or note issues created over the next 12 months by industrial companies for either new construction or additions to working capital." The position of several large companies from the viewpoint of cash is given, and among others these: "The Westinghouse committees have about succeeded in raising all the money they will require for putting the reorganization plan through. The General Electric Company has more money on hand than it can profitably employ in its business, and has been a lender of funds. The Allis-Chalmers Company is strong from the standpoint of cash." The article concludes as follows: "The fact that few industrial companies are dependent upon the banks and trust companies for cash will make it easier for the railroads in need of cash for equipment and other purposes to negotiate funds."

Sealed proposals will be received at the office of the supervising architect, Washington, D. C., until September 23d, for an electric passenger elevator in the United States postoffice and courthouse at Raleigh, N. C., in accordance with drawings and specifications, copies of which may be obtained at the above office.

Utah is coming into greater prominence as a copper producer than ever before. Estimates for June and July are about 8,500,000 pounds a month, and are expected soon to reach a rate of 100,000,000 pounds per annum. The developments at the copper mines in Utah the last few years are remarkable, and with the steam-shovel method of getting out the ore, and the most modern facilities for concentrator treatment on an enormous scale, the state is making a reputation as a low-cost copper producer.

The copper market has given evidence of recovery from its recent depressed condition and the electrolytic product has been demanding up to 14 cents for several days of the past week. Consumers report the volume of their business is increasing gradually, and it is claimed that the producers and selling agents have sold the most of their possible production up to the middle of October, and further, that stocks of copper metal in this country actually declined during the month of August. This was by reason of the export movement, however, as it cannot be denied that the international stocks of copper are large.

BUSINESS

The National Electric Company has been incorporated at St. Louis, Mo., with a capital stock of $10,000, to conduct an electrical supply business.

The business of the Western Electric Company during August has shown an increase of 25 per cent. The increase has been mainly in the demand for telephone apparatus.

A new sales office has been opened in the Gumbel Building, Kansas City, Mo., by the Crocker-Wheeler Company, Ampere, N. J., for the sale of C-W motors, dynamos, transformers, switchboards, etc. The office is in charge of Mr. A. W. Paine, who will give personal attention to business in Kansas City and vicinity.

The New Lexington High Voltage Porcelain Company of New Lexington, Ohio, has appointed as its agent for California the Pacific Electrical Works of Los Angeles, and as its agent for Oregon and Washington the Fobes Supply Company of Seattle and Portland. These two companies will look after the Pacific Coast trade, and both are equipped to give full information concerning the New Lexington gas-fired insulators.

The United Electric Company has opened a complete new retail store at 123 N. Market Street, Wichita, Kan., in charge of its selling subsidiary, the Southwestern Electric Company. A complete line of electrical supplies, fittings and novelties is in stock, and the company has a force of experienced electricians for its contracting and repair business. Robert Sutton and Edward Violette, both of Wichita, are managing the new enterprise.

The Economical Electric Lamp Company, 96 Warren Street, New York city, announces that it has purchased the trademark "Hylo" and all patents on Hylo lamps and that it is prepared to furnish these lamps as well as its own well-known types of pull-string, turn-bulb and long-cord "Economical" turn-down lamps. It is also putting out an electrically operated show-window demonstrator which has helped the sale of turn-down lamps in a most effective manner.

Announcement is made by the Holophane Company that it has acquired and hereafter will have exclusive control of the metal reflectors designed by and manufactured under the patents of Mr. Henry D'Olier, Jr. These reflectors will hereafter be known as Holophane-D'Olier metal reflectors. They are made in 28 sizes and styles and are furnished in four exterior finishes. The interior finish in all cases is a special satin aluminum, giving a well-diffused reflection of almost pure white color. Special facilities for shipping these reflectors undamaged have been provided for. Bulletin No. 10, describing these reflectors, is just ready for distribution.

DATES AHEAD

Association of Edison Illuminating Companies (annual convention), Hotel Aspinwall, Lenox, Mass., September 15th, 16th and 17th.

Colorado Electric Light, Power and Railway Association (annual convention), Glenwood Springs, Colo., September 16th, 17th and 18th.

Arkansas Association of Public Utilities Operators (first annual convention), Little Rock, Ark., September 17th and 18th.

Old Time Telegraphers' Association and Society of the United States Military Telegraph Corps (annual reunion), Cataract-International Hotel, September 16th to 18th.

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

Sons of Jove (annual meeting), Buffalo, N. Y., October 15th and 16th.

American Electrochemical Society (fall meeting), New York city, October 30th and 31st.

Association of Car Lighting Engineers (first annual convention), Chicago, November 16th to 21st.

Chicago Electrical Show (fourth annual), Coliseum, January 11th to 23d, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) August 25, 1908

896,700. Electrical Conducting Cord. George F. Atwood, East Orange, N. J., assignor to the Western Electric Company, Chicago, Ill. Application filed January 22, 1906.

The cord has a flexible steel-wire core.

896,705. Process for Hardening Tantalum. Werner von Bolton, Charlottenburg, Germany, assignor to Siemens & Halske. Application filed September 12, 1905.

The process consists in heating the tantalum to glowing in the presence of carbon.

896,715. Forming of Filaments Out of Viscose or Similar Viscous Material. Charles A. Ernst, Lansdowne, Pa., assignor to Silas W. Pettit, Philadelphia, Pa. Application filed October 18, 1907.

The filaments are formed out of viscose by dissolving cellulose xanthate in caustic soda, adding an acid to the viscose formed, and then spinning it in a weak acid bath.

896,738. Regulator for Dynamo-electric Machines. William C. Mayo and John Houlehan, El Paso, Tex., assignors of one-third to George E. Briggs, Barstow, Tex. Application filed June 27, 1907.

The regulator maintains a constant voltage by regulating the power applied to the dynamo rotor through an arrangement of two solenoids, one in series and one in parallel with the dynamo leads.

896,740. Electric Track Brake. William C. Mayo, El Paso, Tex., assignor of two-thirds to himself, and George E. Briggs, Barstow, Tex., and one-third to John Houlehan, El Paso, Tex. Application filed November 22, 1907.

The electromagnetic shoe has two or more coils for magnetizing the shoe, and a controller by which the coils are connected in either multiple or series to control the action of the shoe.

896,748. Thermostat. John Nelson, Chicago, Ill., assignor to the Chicago Heat Regulator Company, Chicago, Ill. Application filed October 5, 1906.

The thermostat bar co-operates with a pair of contact pins to close an electric circuit. The temperature limit may be set by a handle and dial.

896,749. Electrochemical Concentration of Liquids. George W. Nistle, North Muskegon, Mich., and Robert L. Gifford, Chicago, Ill. Application filed June 22, 1907.

A metal for which it has chemical affinity is combined with the electrolyte, serving as an anode, and an electric current is sent through the electrolyte to a second electrode, while heat is applied from an external source.

896,752. Malting Process. Alfred Oertel, Godesberg, Germany, assignor to Deichmann & Cie., Cologne, Germany. Application filed August 26, 1904.

The process consists in subjecting grain to the action of dark electric rays produced by high-tension alternating currents of a potential above 1,000 volts.

896,754. Electric Snap Switch. Johann G. Peterson, Hartford, Conn., assignor to the Arrow Electric Company, Hartford, Conn. Application filed January 10, 1908.

The construction of a switch of the double push-button variety is described.

896,755. Horsepower-hour Meter. Johannes Picht, Halle-on-the-Saale, Germany. Application filed October 23, 1906.

The power of an engine may be measured by taking the product of the steam pressure, the speed, and a constant which is unvaried for any engine. The invention accomplishes this result automatically by an arrangement of two rheostat arms controlled by the steam pressure and the centrifugal lift of the governor, respectively, which supply proportional currents to the coils of a meter which is calibrated to read directly in horsepower.

896,764. Circuit-breaker Contact. William M. Scott and Harry C. Campion, Jr., Philadelphia, Pa.; Campion assignor to Scott. Application filed January 30, 1906.

The carbon contact piece is grooved and electroplated for reinforcement.

896,793. Annunciator. Edward Baum, Baltimore, Md. Application filed September 19, 1907.

An arrangement of electric lights with a vibrating bell is described.

896,796. Telephone Apparatus. Sidney A. Beyland, Elyria, Ohio, assignor to the Dean Electric Company, Elyria, Ohio. Application filed February 28, 1905.

The instrument standard and base for a desk-set is described.

896,802. Electrode for Lightning Arresters. Frank B. Cook, Chicago, Ill. Application filed November 27, 1907.

The electrode is a carbon block having non-conducting, adhesive material applied to its active surface so as to expose only the high portions.

896,808 and 896,809. Relays. Frank L. Dodgson, Buffalo, N. Y., assignor to the General Railway Signal Company, Buffalo, N. Y. Applications filed March 2 and May 17, 1906. Renewed February 21, 1908.

Two permanent magnets are pivoted so as to swing in a plane at right angles to the cores of an electromagnet, having their polarity so arranged that the magnetic effect of all four poles tends to rotate them in the same direction.

896,811. Metallic Film for Use with Storage-battery Electrodes and Process of Preparing the Same. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to the Edison Storage Battery Company, West Orange, N. J. Application filed February 6, 1908.

Nickel or cobalt films, having minutely roughened or matted surfaces, are mixed with the active material of the storage battery.

896,812. Storage Battery. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to the Edison Storage Battery Company, West Orange, N. J. Application filed March 18, 1908.

The battery plate is constructed with a number of tongues which secure removable pockets.

896,828. Selective Mechanism for Testing Devices. Albert B. Herrick, Cleveland, Ohio. Application filed November 25, 1904.

An insulating disk, with certain perforations, is arranged to rotate in front of a bank of contact posts, aligning only certain of the posts with its perforations and showing by means of a dial and pointer the connections included in each position.

896,830. Telephone Meter. Newman H. Holland, Brookline, Mass., assignor to Charles Bate, Boston, Mass. Application filed March 3, 1902. Renewed September 11, 1905.

The recording instrument depends for its action upon the consecutive flow of currents of different character.

896,831. Signaling. Mark H. Hovey, Buffalo, N. Y., assignor to the General Railway Signal Company, Buffalo, N. Y. Application filed November 27, 1905. Renewed February 21, 1908.

An electric locking circuit is combined with an arrangement of track relays.

896,832. Selective Call Apparatus. John A. Hulit, Topeka, Kan. Application filed October 30, 1905.

An arrangement of a pawl and ratchet is described.

896,836. Telephone System. John J. Kelly, St. Louis, Mo. Application filed April 25, 1907.

The subscriber rings the called station after the connection has been completed at the board.

896,838. Electrical Apparatus. Charles J. Klein, New York, N. Y., assignor to Ralph Abraham Schoenberg, New York, N. Y. Application filed November 27, 1906.

A face-plate designed to protect electrical connections is described.

896,839. Alarm System and Apparatus. John M. Latimer, Flushing, N. Y., assignor to the Consolidated Fire Alarm Company, New York, N. Y. Application filed September 18, 1905.

A sprinkler system operates by grounding the circuit in case of temperature rise which affects a thermometer.

896,840. Alarm Transmission. John M. Latimer, Flushing, N. Y., assignor to the Consolidated Fire Alarm Company, New York, N. Y. Original application filed September 18, 1905. Divided and this application filed September 1, 1906.

There are two sets of contacts, both of which are revolved by a common driving spring, which complete two separate signals.

896,841. Pressure-tank Alarm. John M. Latimer, Flushing, N. Y., assignor to the Consolidated Fire Alarm Company, New York, N. Y. Original application filed September 18, 1905. Divided and this application filed September 1, 1906.

A pressure chamber has a movable wall which operates contacts upon increased pressure in the tank in which the alarm device is submerged.

896,842. Railway Signaling Apparatus. William Macomber, Buffalo, N. Y., assignor to the General Railway Signal Company, Buffalo, N. Y. Application filed February 20, 1905. Renewed February 21, 1908.

The position of the signal arm is automatically reported.

896,868. Electrical Clutch or the Like. Abram P. Steckel, Buffalo, N. Y. Application filed December 7, 1907.

A conducting ring is supported in a plane perpendicular to the axis of the clutch.

896,874. Hot-box Indicator. Henry Williams, Chicago, Ill. Application filed October 28, 1907.

A fulminous cap in contact with the bearing releases a contact spring on abnormal temperature rise, closing an alarm circuit.

896,878. Conduit for Electric Conductors. Albert E. Woodhouse, Kew, Victoria, Australia. Application filed March 10, 1906.

The conduit is a sheet-metal trough with diverging spring side walls.

896,882. Vibratory Massage Device. Asa H. Arnold and Albourne F. Furbush, Poughkeepsie, N. Y. Application filed April 15, 1908.

The vibrating plate is operated by an electromagnet supplied through a contact similar to that of a common vibrating bell.

896,886. Construction of Electromagnets. Arthur F. Berry, Ealing, England. Application filed January 21, 1907.

The magnet comprises a winding and a magnetic circuit built up of plates having axially parallel limbs connected together to embrace the inner and outer peripheral surfaces and inner end of the winding and to permit the latter to be inserted in position axially.

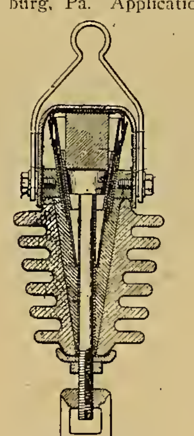
896,921. Torpedo Boat. Edward J. Kelley, Washington, D. C., assignor of one-eighth to Robert L. Nutt and one-sixteenth to Robert A. Hutchins, Jr., Portsmouth, Va. Application filed August 6, 1907.

The color of a stern signal light is varied by the position of the rudder. The torpedo boat is driven by an electric motor which is controlled from a distant point.

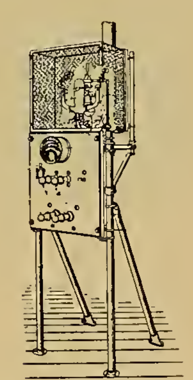
896,930. Alarm Clock. Elijah McComb, Johannesburg, Transvaal. Application filed January 27, 1908.

An alarm-bell circuit is closed by the rotation of the alarm-spring spindle of a clock at a predetermined time.

896,934. Insulator. John P. Nikonow, East Pittsburg, Pa. Application filed October 22, 1907.



No. 896,934.—SUSPENSION INSULATOR



No. 896,980.—RECTIFIER PANEL

Details of suspended-type insulator construction are described. (See cut.)

896,935. Arc Lamp. Ludvik Ocenásek, Prague, Austria-Hungary. Application filed November 27, 1906.

A fusible pin supports the carbons against downward movement until its end is melted off, when the carbons are allowed to drop.

896,951. Soldering Machine for Commutators. Harry Stone, Wilmerding, Pa., assignor to the Westinghouse Air Brake Company, Pittsburg, Pa. Application filed September 23, 1905.

The machine comprises an axle support for the armature and a gas-heated soldering tool having a curved face adapted to fit the commutator.

896,973. Charging System for Storage Batteries. Fred B. Corey, Schenectady, N. Y., assignor to the General Electric Company. Application filed March 21, 1907.

The line-operating means responsive to a reversal of current in the line conductor shifts each station switch with a snap action to one of its operative positions either in connection with the line conductor or the translating device.

896,975. Range Keeper. Arthur T. Dawson and George T. Buckham, Westminster, London, England, assignors to Vickers Sons & Maxim, Ltd., London, England. Application filed February 1, 1907.

The range-keeper dial is electrically operated from the sending station.

896,979. Field Regulation for Motor-Generators. Charles E. Eveleth, Schenectady, N. Y., assignor to the General Electric Company. Application filed March 1, 1907.

Controlling means connected to the motor-generator is responsive to the generator voltage for simultaneously and oppositely varying the speed of the motor and the field strength of the generator.

896,980. Rectifier Panel. Samuel Ferguson, Schenectady, N. Y., assignor to the General Electric Company. Application filed September 18, 1905. Renewed February 26, 1908.

The rectifier panel carrying the mercury-vacuum tube is mounted above and in a plane behind that of the switchboard panel, and is protected laterally by screens. (See cut on preceding page.)

896,983. Transformer-core Construction. John J. Frank, Schenectady, N. Y., assignor to the General Electric Company. Application filed May 1, 1907.

In the jointed and laminated magnetic core, the laminæ are interleaved at the joints and have square corners, with notches located dissymmetrically at the interleaving ends of a portion of the laminæ.

896,984. Conduit for Electric Wires. Horace C. Freeman, St. Paul, Minn. Application filed July 13, 1907.

The trough is formed with a depression in its side walls registering with the channel of the gutter of which it forms a continuation.

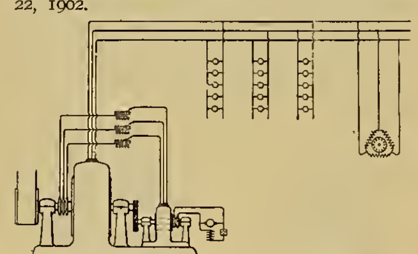
896,993. Control System for Motor-driven Reciprocating Devices. Leopold Janisch, Berlin, Germany, assignor to the General Electric Company. Application filed December 14, 1907.

When the reciprocating mechanism has moved to a certain point in either direction the motor is prevented from being operated at a speed in excess of a certain speed which is slow in comparison with the speed at which it may be run before it reaches that point.

896,999. Meter. William J. Lloyd, Rugby, England, assignor to the General Electric Company. Application filed October 2, 1905.

Leads enter the mercury receptacle at diametrically opposite points to connect the armature in circuit.

897,013. Method of Generating and Distributing Alternating Currents. Edward B. Raymond, Schenectady, N. Y., assignor to the General Electric Company. Application filed December 22, 1902.



No. 897,013.—EXCITATION BY ALTERNATING CURRENT

The method consists in exciting the field of the machine by a source of alternating current of low-frequency and constant voltage and deriving alternating current from the armature by driving the machine by mechanical power at a speed and in a direction such that it runs greatly in excess of synchronism with the exciting current. The compounding action of the generator is varied by varying the drop in voltage between the exciter and the machine. (See cut.)

897,019 and 897,020. Electric Clock Mechanism. George H. Rupley, Schenectady, N. Y., assignor of one-half to Frank J. Seabolt, Schenectady, N. Y. Applications filed April 2 and October 29, 1906.

The winding member comprises an electric motor and contacting members which are driven in opposite directions depending on the connection of the driving motor.

897,024. System of Electric Metering. Ernest Schattner, Schenectady, N. Y., assignor to the General Electric Company. Application filed September 28, 1904.

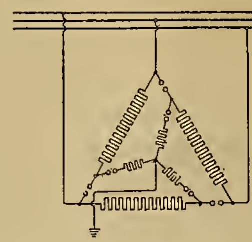
The field coils of the meter may be connected in different arrangements to the circuits to be measured.

897,028. Circuit System for Telephone Repeating Apparatus. Herbert E. Shreeve, Newton, Mass., assignor to the American Telephone and Telegraph Company. Application filed March 15, 1907.

The principle of the reinforcing circuit is that of having an input coil for delivering energy from the line to the reinforcing circuit, and an output coil for supplying renewed energy from the reinforcing circuit to the line.

897,031. System of Control. Emmett W. Stull, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed January 20, 1908.

The magnet which controls the switch opening the motor circuit is energized only when the controller is moved backward to its first operative position.



No. 897,211.—PROTECTIVE DEVICE

897,039. Process for Purifying and Filtering Water. Alfred Vogelsang, Dresden, Germany. Application filed April 23, 1907.

As described, this method of purifying and filtering water according to a biological purifying process, consists in passing the water through a purifying or oxidizing body, adding ozone in small quantities to fresh air for the purpose of rendering the oxygen in the latter more active and effective without disturbing the biological process, and then passing the ozonized air through the purifying body.

897,042. Telephone System. Alfred H. Weiss, Chicago, Ill., assignor to the Kellogg Switchboard and Supply Company, Chicago, Ill. Application filed December 13, 1902.

A telephone circuit is described.

897,062. Cable Terminal. Frank B. Cook, Chicago, Ill. Application filed June 28, 1907.

A spring member holds the terminal-head cover in place when firmly seated.

897,063. Roller-bearing Trolley Wheel. William L. Cooksey, Fort Worth, Tex. Application filed August 22, 1907.

For a high-speed trolley wheel the inside bearing face is supported by three relatively large rollers arranged in trefoil relation about a small axle.

897,084. Appliance for Use with Telephone Transmitters. Orrin H. Goodrich, Castleton Corners, N. Y., assignor to Edward F. Hutton, New York, N. Y. Application filed January 4, 1908.

The transmitter is enclosed in a box fitted with an opening which encloses the user's face, protecting the transmitter from external sounds.

897,085. Spring-jack for Telephone Switchboards. Georg Grabe, Wilmersdorf, Germany, assignor to Siemens & Halske Aktiengesellschaft, Berlin, Germany. Application filed November 10, 1904. Renewed July 1, 1908.

The springs are so bent and embedded in the insulating material that no screws or pins are required.

897,110. Electric Incandescent Lamp. Hans Kuzel, Baden, near Vienna, and Richard Hoke, Vienna, Austria-Hungary; said Hoke assignor to said Kuzel. Application filed March 5, 1907.

The suspension is of the metal-filament type and the individual filaments are horseshoe shaped.

897,119. Telephone Signal. Charles Mahler, New York, N. Y. Application filed April 27, 1907.

A series of electromagnets is individual to each branch telephone and through a set of corresponding levers certain bells are rung.

897,122. Spark Plug for Internal-combustion Engines. Henry C. ter Meer, Summit, N. J. Application filed March 27, 1908.

A very long interior path is interposed between the electrodes.

897,130. Safety Circuit Closer. Leon Ottinger, New York, N. Y. Application filed February 11, 1905.

The contact pieces are enclosed.

897,138. Signal System. Robert Pfeil, Grunewald, Berlin, Germany, assignor to Siemens & Halske, A. G., Berlin, Germany. Application filed April 12, 1906.

The signals are controlled by both a lever and the track conditions, the former being partially limited by the latter.

897,147. Electric Regulator. Thomas M. Pusey, Kennett Square, Pa. Application filed November 21, 1907.

A conducting liquid rests on a non-conducting liquid by reason of different specific gravity, while a movable plunger electrode varies the current by the exposure of a varying surface to the conducting electrolyte.

897,149. Brake Setter. William A. Rideout, Sr., Oshkosh, Wis. Application filed June 10, 1907.

The brake is automatically set by the release of a valve by an electromagnet which is energized from a signal third rail placed between the tracks.

897,166. Electric Motor. Wilfred Shurtleff, Moline, Ill. Application filed May 21, 1907.

The field magnets consist of groups of three poles, the larger central pole being flanked on either side by two small poles, the small poles being individually wound in opposite directions and connected to a primary circuit. A winding for the main circuit encloses both the central pole and the coils of the flanking poles.

897,186. Electric Water Heater. Joseph R. Ayotte, Montreal, Quebec, Canada, assignor to Jean Baptiste Albert Martin, Montreal, Canada. Application filed October 2, 1907.

The heat is produced by spark gaps enclosed in mica boxes and submerged in the water.

897,203. Electric Furnace. Johannes Härdén, London, England, assignor to the Gröndal Kjellin Company, Limited, London, England. Application filed May 8, 1908.

An annular fusion chamber surrounds one limb of an iron frame which is enclosed by the primary coil.

897,211. Protective Device for Electrical Systems. Karl Kuhlmann, Berlin, Pankow, Germany, assignor to the General Electric Company. Application filed March 15, 1907.

Between the three conductors of a three-phase system, resistance paths including spark gaps are arranged in delta for the discharge of abnormal potential of relatively low frequency. A path leads to ground through each of the spark gaps, offering less reactance to high frequency discharges than do the resistance paths between the line conductors. (See cut.)

897,212. Lightning Arrester. Karl Kuhlmann, Berlin, Pankow, Germany, assignor to the General Electric Company. Application filed March 15, 1907.

A low resistance forms a discharge path between line conductors, interrupted by spark gaps.

897,215. Electromagnetic Switch. William MacMillan, New York, N. Y. Application filed February 15, 1908.

The switch frog is magnetically moved, being controlled by the car's contact with a track section.

897,218. Electrically Operated Air-brake System. William C. Mayo, El Paso, Tex., assignor of one-third to George E. Briggs, Barstow, Tex., and one-third to William C. Mayo and one-third to John Houlehan, El Paso, Tex. Application filed November 22, 1907.

The valves are electromagnetically operated.

897,226. Means for Generating and Distributing Alternating Currents. Edward B. Raymond, Schenectady, N. Y., assignor to the General Electric Company. Original application filed December 22, 1902. Divided and this application filed November 30, 1903.

The generator field is supplied by an alternating-current exciter.

897,232 to 897,243. Telephone Systems. Harry G. Webster, Chicago, Ill., assignor to Milo G. Kellogg, Chicago, Ill. Applications filed March 27, 1903, to November 6, 1907.

Circuits for telephone systems are described in detail.

897,257. Dynamo-electric Machine. Max R. Hanna, Schenectady, N. Y., assignor to the General Electric Company. Application filed February 19, 1908.

The dynamotor for transforming direct current from one voltage to another has a single armature core and two armature windings provided with independent commutators and adapted to be connected respectively in the supply and load circuits. The field windings are arranged to be inoperative in the normal operation of the machine as a dynamotor but to become effective when the machine is operated as a motor or generator only.

REISSUE

12,845. Electric Piano Player. Timothy ~~B.~~ Powers, New York, N. Y., assignor to the Telelectric Company, Pittsfield, Mass. Application filed October 17, 1903. Original No. 681,730, dated September 3, 1901.

The keyboard is struck by electromagnetically operated levers.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired September 1, 1908:

458,582. Electric-railway System. W. H. Knight, New York, N. Y.
458,583. Electric Railway. W. H. Knight, New York, N. Y.
458,584. Electric-motor Truck. W. H. Knight, New York, N. Y.
458,585. Telegraphy. D. Kunhardt, Aachen, Germany.
458,587. Electric Brake. J. C. Lincoln, Rochester, N. Y.
458,617. Regulator for Constant-current Dynamos. E. P. Clark, New York, N. Y.
458,618. Constant-current Dynamo. E. P. Clark, New York, N. Y.
458,619. Conduit for Electric Railways. F. E. Degenhardt, Chicago, Ill.
458,620. Electric Trolley or Contact Wheel. F. E. Degenhardt, Chicago, Ill.
458,630. Conduit for Electric Railways. E. E. Keller, Chicago, Ill.
458,646. Electric Motor. E. Thomson, Lynn, Mass.
458,652. Electrochemical Transformer. T. D. Bottome, Hoosick, N. Y.
458,653. Incandescent-lamp Cut-out. T. D. Bottome, Hoosick, N. Y.
458,665. Electric Railway. H. A. Seymour, Washington, D. C.
458,666. Automatic Cut-out for Dynamo-electric Machines. S. H. Short, Cleveland, Ohio.
458,702. Electric Generator. J. C. Henderson, New York, and F. Sargent, New Rochelle, N. Y.
458,719. Duplex Arc Lamp. B. B. Ward, New York, N. Y.
458,729. Electric Locomotor. H. F. Shaw, Boston, Mass.
458,747. Electric-railway Conduit and Contact Device. W. H. Knight, New York, N. Y.
458,755. Electric Meter. M. Koechlin, Belfort, France.
458,769. Electric-light Fixture. F. H. Aldrich, Cadillac, Mich.
458,778. Electric Subway. J. C. Reilly, Brooklyn, N. Y.
458,784. Method of and Apparatus for Determining the Temper of Steel. C. A. Caspersson, Forshacka, Marzretchill, Sweden.
458,785. Self-lubricating Electric Trolley. T. Driscoll, Minneapolis, Minn.
458,800. Electric-car Mechanism. Wm. E. Badger, West Quincy, Mass.
458,844. Electric Railway. L. O. Dion, Natick, Mass.
458,846. Elevated Railway. J. P. Harper, Kansas City, Mo.
458,866. Closed Conduit for Electric Railways. C. J. Van Depoele, Chicago, Ill.

WESTERN ELECTRICIAN

EVERY SATURDAY

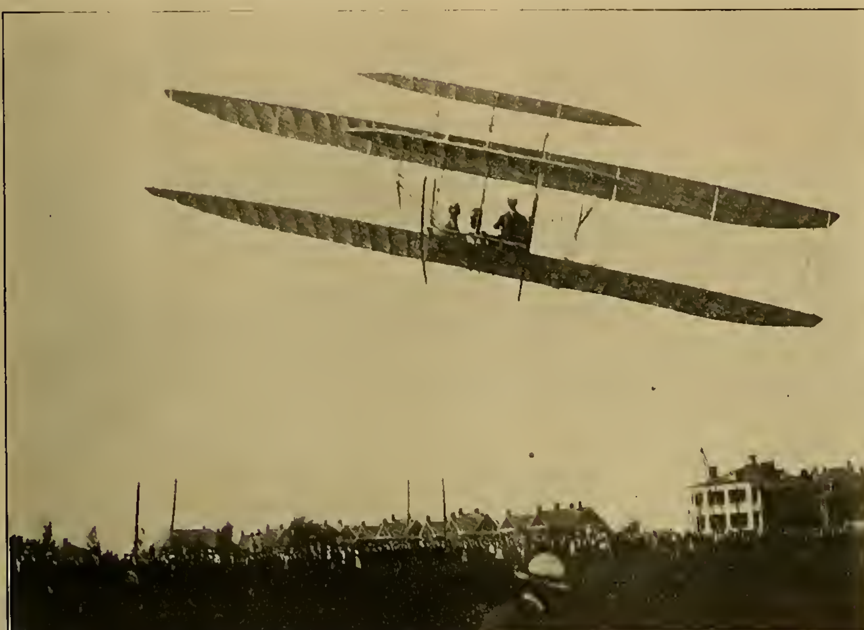
Vol. XLIII. CHICAGO, SEPTEMBER 12, 1908 No. 11

THE WRIGHT AEROPLANE AND WIRELESS COMMUNICATION

By Frank L. Perry

Part I.

It has been generally admitted the world over that if a successful aeroplane were developed it would probably prove to be the connecting link through which wireless telegraphy and telephony would greatly, if not entirely, change methods of warfare. The dirigible balloon is nothing more than a balloon with a propeller and practically is at the mercy of even a comparatively light breeze, while a bullet or shot puncturing its thin sides might be sufficient to bring about its destruction.



Photograph by J. S. Reid, Washington, D. C.

FIG. 1. ORVILLE WRIGHT IN FLIGHT AT FORT MYER, VA., ON SEPTEMBER 3, 1908

If successful, the aeroplane would not only be navigable with and against the wind, but would be at the same time probably practically bullet-proof, in that a small shot hole through any one of the planes of the aeroplane would have but little effect on its flight. In view of these facts the results of the tests to be made with aeroplanes chiefly by the Wright Brothers and Mr. Herring at Fort Myer, Va., assumed a world-wide importance.

What the Government Requires

A glance at Signal Corps specification No. 486 will enable the scientifically inclined reader to appreciate something of the magnificent work that will have to be performed by Messrs. Orville and Wilbur Wright and Mr. Herring to fulfill the government's severe tests.

Without describing unnecessary details as embodied in this Signal Corps specification, a few of the essential requirements there laid out may be given.

To begin with, the specification is for furnishing the Signal Corps with a heavier-than-air flying machine. It covers "the construction of a flying machine supported entirely by the dynamic reaction of the atmosphere and having no gas bag."

The government stipulated that "the flying machine will be accepted only after a successful trial flight, during which it will comply with all requirements of this specification. No payments on account will be made until after the trial flight and acceptance."

Further, "that it is desirable that the flying machine should be designed so that it may be quickly and easily assembled and taken apart and packed for transportation in army wagons. It should be capable of being assembled and put in operating condition in about one hour."

A further and interesting portion of the specification referring to an extended flight by the machine loaded with passengers and fuel is as follows: "The flying machine must be designed to carry two persons having a combined weight of about 350 pounds, also sufficient fuel for a flight of 125 miles."

The flying machine must be designed to have a speed of at least 40 miles per hour in still air, but bidders must submit quotations in their proposals for cost depending upon the speed attained during the trial flight, according to the following scale:

Forty miles per hour, 100 per cent.
Thirty-nine miles per hour, 90 per cent.

Copyright, 1908, by Waldon Fawcett, Washington, D. C.

FIG. 2. AEROPLANE IN FLIGHT ABOUT FOUR FEET FROM THE GROUND

Thirty-eight miles per hour, 80 per cent.
Thirty-seven miles per hour, 70 per cent.
Thirty-six miles per hour, 60 per cent.
Less than 36 miles per hour, rejected.
Forty-one miles per hour, 110 per cent.
Forty-two miles per hour, 120 per cent.
Forty-three miles per hour, 130 per cent.
Forty-four miles per hour, 140 per cent.

The speed accomplished during the trial flight "will be determined by taking an average of the time over a measured course of more than five miles against and with the wind. The time will be taken by a flying start, passing the starting point at full speed at both ends of the course. This test is subject to such additional details as the chief signal officer of the army may prescribe at the time. Before acceptance a trial endurance flight will be required of at least one hour, during which time the flying machine must remain continuously in the air without landing. It shall return to the starting point and land without any damage that would prevent it immediately starting upon another flight. During this trial flight of one hour it must be steered in all directions without difficulty and at all times under perfect control and equilibrium.

"Three trials will be allowed for speed as provided for in two of the above paragraphs. The three trials for endurance, as also provided for above, and both tests must be completed within a period of 30 days from the date of delivery. The expense of the tests is to be borne by the manufacturer. The place of delivery to the government and trial flights will be at Fort Myer, Va. The aeroplane should be so designed as to ascend in any country which may be encountered in field service. The starting device must be simple and transportable. It should also land in a field without requiring a specially prepared spot and without damaging its structure. It should be provided with some device to permit of a safe descent in case of an accident to the propelling machinery. It should be sufficiently simple in its construction and operation to permit an intelligent man to become proficient in its use within a reasonable length of time."

Bidders were required to furnish evidence "that the government of the United States has the lawful right to use all patented devices or appurtenances which may be a part of the flying machine and that the manufacturers of the flying machine are authorized to convey the same to the government. This refers to the unrestricted right to use the flying machine sold to the government, but does not contemplate the exclusive purchase of patent rights for duplicating the flying machine. Bidders will be required to furnish with their proposal a certified check amounting to 10 per cent. of the price stated for the 40-mile speed. Upon making the award for this flying machine these certified checks will be returned to the bidders, and the successful bidder will be required to furnish a bond, according to army regulations, of the amount equal to the price stated for the 40-mile speed. The price quoted in proposals must be understood to include the instruction of two men in the handling and operation of this flying machine. No extra charge for this service will be allowed. Bidders must state the time which will be required for delivery after receipt of order."

The Flights of September 3d and 4th

"Mysterious," the adjective that heretofore has been so liberally inserted by unthinking correspondents before the names of the Wright brothers, disappeared, and "Wonderful" took its place at sunset on Thursday afternoon, September 3d. The long-looked-for public exhibition of the Wright brothers' aeroplane, in which Orville Wright made a flight above the parade ground lasting one minute and 11 seconds, and during which he completed one and a half circles of this large field, can only be characterized by superlatives. It is no exaggeration to say that this performance was wonderful, superb in fact, and, as one gentleman put it, "It was worth crossing the water to witness."

Mr. Wright had explained before flying that, as he had to operate his machine by a new system of levers, which, although simpler even than the method before employed, was nevertheless new, and he might therefore make some slight mistakes. He circled the grounds once, in magnificent flight and was proceeding to circle the second time when he turned one of the controlling levers the wrong way. The machine was down near the balloon tent (see map, Fig. 3, below), about 20 feet in the air, and was traveling at the rate, he thinks, of about 30 to 35 miles an hour. By accidentally making a wrong shift of one of his new levers he found himself propelled toward and quite close on to a new shed that is being erected to house the aeroplane. Quick to see his danger, however, Mr. Wright instantly realized that he must make a landing, and a quick one. As the mere turning off of the gas and the manipulation of a lever enables him to make quick descent, he managed to land within a few yards of the dangerous obstacle. As the landing was made one of the skids, as shown in Fig. 5, was snapped in two by the impact, but that was all.

Apparently it is no easy matter for an aviator traveling at express speed through the air to keep from making slight errors in shifting his levers. Mr. Wright admitted as much after his descent, and he states that he saw his mistake in a fraction of a second, but he preferred a slight accident, like breaking a skid, to a bad smash against the scaffolding of the new shed. Said Mr. Wright: "I threw the motor off, turned my front planes and struck the earth pretty sharply. I felt only the slightest jar."

It is interesting to note that Mr. Wright has repeatedly stated that as a general thing in most all of the flights it is remarkable that the machine should land so quietly; that it was usually an exceedingly difficult matter to state exactly on what spot the aeroplane alighted.

The two pictures reproduced in Figs. 1 and 2 are valuable in that they present excellent views in flight of the aviator and machine. Fig. 2 shows the aeroplane as it is almost literally skimming the grass within the fraction of a minute after Mr. Wright left the starting track behind. In this picture it is estimated that the bottom of the aeroplane is hardly more than four to six feet from the ground; and at this particular moment the aeroplane is going at the rate, it is thought, of about 38 miles an hour. Fig. 1 is a remarkable picture. In it one can see the upward concaving or "bellying" of the fabric, indicative of the upward pressure that the wooden ribs and the fabric have to bear while the aeroplane is in flight.

As the long and trying wait of 10 days to two weeks had tired out so many of the less enthusiastic would-be spectators, a comparatively small number of persons, only about 200, witnessed the flight, which occurred shortly after six o'clock, about sunset. The throng was "short" on size, but certainly was "long" in excitement and enthusiasm.

The preliminaries to the flight consumed much time and the tension was at such a high pitch that when the machine finally soared into the air, it is no exaggeration to say that many persons became afflicted with a mild form of emotional insanity. There were a number of choking cheers; half gasps could be heard, and much altogether undignified prancing. It is safe to say that there were very few persons on that memorable occasion, which will mark without doubt an epoch in the mechanical world, that did not feel a thrill that will never be forgotten.

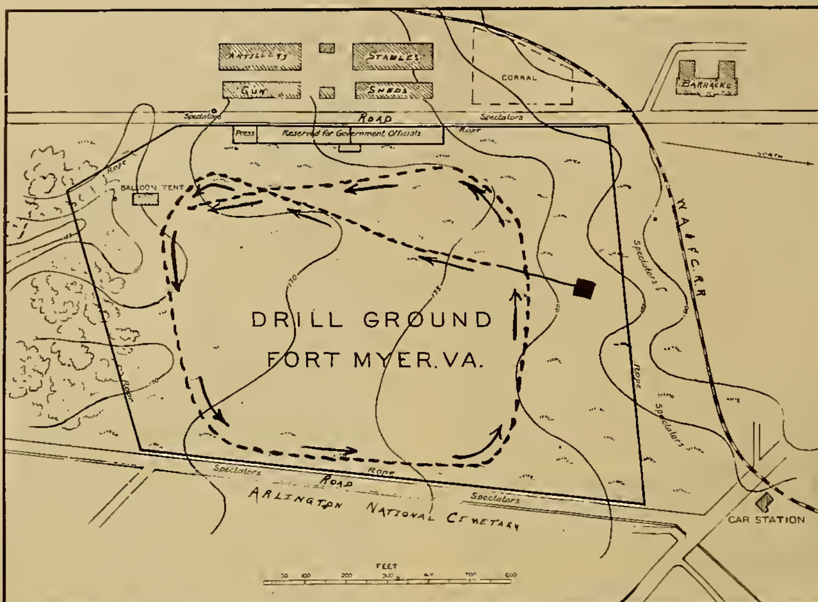


FIG. 3. MAP OF AIRSHIP FLIGHT OF ORVILLE WRIGHT ON SEPTEMBER 3, 1908

Many had from the start doubted there would be any flight, until the aeroplane was in the air. It is to be presumed that these in particular had a few serious thoughts.

Before starting the aeroplane, the two assistants, Messrs. Taylor and Furness, each gave one propeller a good twist. This was to start the gasoline engine into motion. Mr. Wright's practice is then to inspect the machine, shut down the engine, and finally, after a last very close inspection, he takes his seat in the aeroplane, and with his hands on the levers gives the word to start the engine.

In this instance his two assistants started each his propeller into action, and then taking each his stand at the extreme tips of the two main planes of the machine, Mr. Wright gave the word to loosen the weight, which propels the machine forward over the track to its end with a very great acceleration of speed.

The two assistants ran forward with the machine as it started, to keep it balanced on the track. But it tore itself away from them. Thus the machine started, in nautical parlance, on an even keel and with good lateral balance.

For a moment after starting, as it appears in Fig. 2, the machine seemed literally to skim the top of the grass and weeds of the field. It had a peculiarly wavy or undulatory motion, and appeared as though it would at any moment plunge its forward rudder into the grass. It is hard to imagine the nervous tension of the spectators at such a thrilling moment, and it is likewise hard to realize the elation that came when it was seen that the beautiful aeroplane was instead mounting in a most superbly graceful manner right up into the air, for all the world like a monster bird.

During this first flight the machine proceeded with startling rapidity, literally like an express train in motion, but it flew with this peculiarly graceful and undulatory motion, almost oscillatory, in short waves, up and down, giving the impression at each dip that it might drop to the ground. But when one realized that during even this short flight of one minute and 11 seconds, Mr. Wright made a large number of turns, in fact, was turning most of the time, and was therefore compelled constantly to manipulate his three levers, the maintenance of his performance from an intellectual standpoint can perhaps be slightly appreciated. A fuller appreciation will come, too, with the recollection that the aviator controls his machine chiefly by the skill with which he manipulates his planes. One quick false move of the lever to his left, with the machine flying at the speed of an express train, and down it would plunge.

The average height in the flight above the earth was estimated at about 30 feet. But it is stated by Mr. Wright that the aeroplane has been carried in flight as high as 100 feet above the earth.

The flight on Friday, September 4th, was another superb and startling demonstration of the Wright brothers' command of the situation. Orville Wright was certainly on Friday "master of the air." He circled the parade grounds this time five and a half times, along practically the same line as is indicated on the map, Fig. 3, and traveling an estimated distance of at least 2½ miles

Black Spots, Five Miles Apart, Indicate Airship Course
FIG. 4. MAP OF COUNTRY NEAR WASHINGTON, D. C.

at an average speed of 36 miles. Major Squier's statement that the flight was something "magnificent, superb," may be taken by even the most conservative as a worthy characterization. Other army officers who witnessed the flight declared it to be the most wonderful exhibition of its kind they had ever expected to see.

This time Mr. Wright seemed as self-possessed as an automobile driver proceeding at a six-mile rate. He descended with remarkable ease, and to the spectators it seemed as though the big machine settled to earth as gently as a bit of thistledown. Apparently, the aeroplane could have been kept in the air indefinitely. Right here, it is no idle prophecy to say that Mr. Orville Wright will remain in the air the required hour and will have no difficulty whatever in proceeding on his five-mile-and-return trip. Mr. Wright is purposely proceeding carefully in his work. He wants to "find himself" until he feels absolutely secure in his knowledge of what might be called his aeroplane's "personal equation."

An amusing incident occurred during the preparation for Friday's flight. Lieutenant Willoughby, an ex-naval officer and an enthusiastic aeronaut, together with Mr. Orville Wright and the writer, were proceeding from the balloon tent across the field to the starting tower. A cordon of cavalrymen had been, at Mr. Wright's request, strung around the field with the idea of keeping back the crowd. Mr. Wright feared an accident with his high-speed machine in, perhaps, its descent.

While the spectators were being ignominiously routed from the field by the horsemen, one very zealous cavalryman rode down upon the little party, and with them almost under his horse's hoofs, ordered Mr. Wright from the field, remind-

increased consumption of power immediately it commences to go "uphill," so to speak, just in the same manner that an automobile would indicate that it was on up-grade.

The two maps given herewith, Figs. 3 and 4, will give some idea not only of the startling character of the flights, but as well of the tremendous performance that Mr. Wright will have to fulfill before he carries off his $25,000 prize, the price to the government of the aeroplane now at Fort Myer. Fig. 3 is a map of the drill grounds at Fort Myer. The heavy dotted black line and the arrows on this map show roughly the course of the flight around the drill grounds.

The starting tower and track are indicated to the right on the map by a black square dot. The space outside of the ropes was reserved for spectators. The scale of feet will enable the student to get a more accurate idea of the distance of the flight. Fig. 4 is a map of the country between Fort Myer and Alexandria, over which the trials of the dirigible balloon and two aeroplanes to be furnished the United States government will take place. The most probable course is that from Fort Myer to Alexandria. These places are indicated on the map by two round black spots within the large circle. The radius of the large circle is five miles.

This View Shows, at the Bottom, the Slight Fracture Due to the Sudden Landing of September 3d. Details of Gasoline Engine and Pointed Tank, also Chain Gearing and Propellers, can be Plainly Seen

FIG. 5. WRIGHT BROTHERS' AEROPLANE

ing him that the "Wright fellow" would not stand for any delay. A few well-chosen words awakened the intelligence of the overzealous member of Uncle Sam's military family, and Mr. Wright was allowed to proceed.

In this second flight the machine rose in the air much quicker than on Thursday. It skimmed the grass for a few feet, quickly rose to about 20 feet, and then sailed off and circled 5½ times around the field in perfect ease. The aviator without doubt had better control of his machine, for a very perceptible diminution of the up-and-down oscillatory movement was noticeable Friday.

Every time the aeroplane circled past the starting point, there was a spontaneous burst of wild enthusiasm. Of course, Mr. Wright heard nothing, as the aeroplane's engine makes a noise like a rapid-fire machine gun. Five times he circled about. On the sixth lap he pointed the machine toward the balloon tent at the lower end of the field. The propellers were suddenly stopped and the aeroplane glided to the earth, alighting at about the spot on which he had previously stated he would alight. The machine slid along on the skids for a few feet and came to a stop almost at the very door of the tent in which it is housed.

Mr. Wright gives as the reason for the dipping at the curves, that he was obliged to pay more attention at these points to the steering of the machine rather than to the maintenance of it on a level. He considers that the machine behaved beautifully and that the motor was in perfect working order. He says it is his plan, however, not to undertake long flights at the outset, and it is his present purpose to carry out his endurance test of one hour at Fort Myer, circling about the parade ground rather than by flying off over the surrounding country.

As might be supposed, the aeroplane shows an

A glance at the machine in flight (Fig. 1), reveals very clearly the method in which the planes are "skeletoned" and also the way in which the muslin is stretched on the framework. It is plain to see also in this remarkable picture how the muslin becomes concave, so to speak, when bearing down on the air. It might be understood from a casual glance, but it should be explained, that the planes consist of two muslin surfaces, one on the upper surface of the frame, the other on the lower surface. A point to be noted, too, is that the forward portion of the edge of the two main planes is at least an inch and a half thick and rounded, while the back edge of the two planes is tapered to a sharper edge.

During the several days preceding Fridays' flight I interviewed a number of United States signal officers relative to prospective use of the aeroplane in connection with wireless-telegraphic apparatus, and the views of these gentlemen will be given in the next installment of this article.

POWER DEVELOPMENT AT DULUTH

One of the important hydro-electric power developments of the country is that of the Great Northern Power Company of Duluth, Minn., utilizing the waterpower of the St. Louis River. Generating machinery of about 30,000 horsepower is now in place, and the ultimate capacity of the initial equipment, to be installed as needed, is about 100,000 horsepower. By developing other water rights on the river owned by the company a total capacity of 200,000 horsepower can be made available. Recently $1,500,000 worth of bonds has been sold, making a total bond issue of $5,500,000, $500,000 of which is held in Duluth. Mr. R. M. Watson of Harrisburg, Pa., who is closely affiliated with the Jay Cooke estate and is a capable engineer and man of affairs, has been made vice-president and managing director of the company. Power is now being supplied for operating all street cars in both Duluth and Superior, for public and private lighting in both cities, for the pumping of the city water supply, and for various private corporations and power users. In all some 15,000 horsepower from the first installation is now in use.

A GREAT IRRIGATION AND HYDRO-ELECTRIC PROJECT IN MEXICO

The Federal government of Mexico has agreed to give its financial support to the proposition to build a great dam across the Nazas River at a point where it emerges from the mountains, about 100 miles southwest of Torreon. Government engineers have been making surveys and estimates of the projected dam for several months. According to these estimates, the dam will cost about $6,000,000, gold, to build. It will be one of the largest water-storage reservoirs on the continent and will afford a water supply for the whole Nazas River cotton-growing district for a period of three years without replenishing. In connection with the great dam, it is planned to install a hydro-electric plant which will generate enough electric power to supply all of the towns within a radius of 150 miles.

In the Nazas River Valley lies the principal cotton-growing region of Mexico. The soil is exceedingly rich and the staple produced here is of extraordinarily good quality. Owing to the uncertainty of rains in the mountains, the Nazas River cannot be depended upon to give an adequate water supply for irrigation purposes when most needed. By storing the water this difficulty will be overcome.

The contract for building the great dam has been awarded to the firm of S. Pearson and Son of London, England, who have performed a number of large contracts for the Mexican government, particularly in improving the harbors of Vera Cruz, Coatzacoalcos and Salina Cruz.

There are many large industrial plants in the Nazas Valley which will be provided with cheap power from the proposed hydro-electric plant, and it is expected that the establishment of manufacturing enterprises will be greatly stimulated under the new condition of affairs. The site of the proposed dam is in the San Fernandez Canyon.

EXTENSIVE "WIRELESS" PROJECT FOR SOUTH PACIFIC

Capitalists who are interested in the Ocean and Pleasant Islands of the Gilbert group and also in the island of Makatea of the Tuamotu Archipelago, have recently begun a movement to connect nearly all the groups of islands in the South Pacific by a system of radio-telegraphy. It is proposed to include in this system Australia, New Zealand and the Fiji group as well as the New Hebrides, the Solomon, Samoan, Cook, Society and Marquesa Islands, and the phosphate islands of Ocean, Pleasant and Makatea.

It is expected that the various governments having possessions in the South Pacific will aid in the establishment of the proposed system. Negotiations have already proceeded so far that the success of the efforts seems to be almost assured, says Mr. J. D. Dreher, the United States consul in Tahiti. As the nearest available ocean cable office to Tahiti is at Auckland, 2,250 miles away, from which a steamship arrives at Papeete once every 28 days, and a direct communication by steamship with San Francisco, 3,658 miles distant, is had once in every 36 days, it will be understood how deeply interested the French colony of Tahiti and its dependencies are in the complete success of these negotiations.

The name of the proposed company is the Pacific Islands Radio-telegraph Company. Of the proposed capital of $340,000, the owners of the phosphate deposits on Ocean and Pleasant islands have subscribed about one-seventh. In this radial system there will probably be 10 or 12 circles, the largest having a radius of 1,250 miles, and requiring for each station an engine of 60 horsepower. It has not yet been decided where the main office of the proposed company will be.

For the prevention of static discharges from belts satisfactory results are reported from coating with bronze or aluminum powder, while a weekly application of acid-free glycerine is a remedy and adds durability to the leather.

PRINCIPLES OF FAULT LOCATION[1]

By Julius Bernstein

In presenting this paper on fault location, the subject will be treated in a general way, with the hope that those who are not familiar with the principles upon which are based some of the ordinary measurements for the location of faults will recognize that these fundamental principles are quite simple and are easily understood.

My remarks, which are based upon the methods of telephone practice, will be confined to the use of those testing instruments which are based upon the principle of the Wheatstone bridge, inasmuch as practically all faults can be located by the "loop" methods, which are particular cases of the Wheatstone bridge. While it is possible easily to determine the nature of a fault by simple tests and, with a good knowledge of line conditions, an experienced tester can often approximate the distance to a fault, it is always desirable to make an exact location with a testing set, in order that every facility may be afforded in finding and clearing the trouble in the shortest possible time. The voltmeter can be used for some tests, but at their best, these are rough, and are not to be recommended except where instruments for the more reliable tests are lacking.

Wheatstone Bridge

Our first consideration will be an explanation of the Wheatstone bridge. The system of conductors called the Wheatstone bridge, is the most common of the several arrangements for measuring resistances, and is represented by the familiar conventional diagram shown in Fig. 1.

The current from the battery is made to branch into two paths at c and reunite at d, so that part of the current flows through the points e and f. A, B, X and R are known as the arms of the

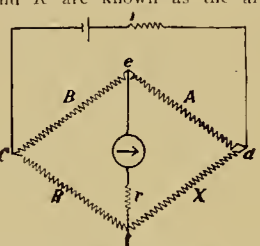


FIG. 1. DIAGRAM SHOWING PRINCIPLE OF WHEATSTONE BRIDGE

bridge, although in practice A and B are termed the "bridge arms" or "ratio arms," R the "rheostat," and X the "unknown resistance." When the galvanometer shows no deflection, it becomes evident that the two points c and f are at equipotential, since current flow can only be the result of potential difference.

The bridge is said to be balanced, and the resistances in the arms will then have relation to each other as expressed in the simple proportion.

$$\frac{A}{B} = \frac{X}{R}, \text{ or } A \times R = B \times X.$$

From the foregoing simple proportions, it is apparent that, by knowing the values of three arms of the bridge, the fourth can be quickly calculated.

$$\text{or } X = \frac{A}{B} R.$$

It is to be noted that any resistances in the galvanometer r or battery r' circuits do not affect the values or ratios of the bridge arms. It is also to be noted that the position of the galvanometer and battery may be interchanged without in any way affecting the law of the bridge.

The Wheatstone bridge would have a restricted range of measurement if the arms were equal. It will be evident that the adjustable resistance will represent the total amount of the unknown resistance that can be measured under conditions of equal bridge arms. By altering the ratio of the arms of the bridge we can measure very high or very low resistances. This is accomplished in an actual bridge by placing in the arms A and B resistances having values of at least 1, 10, 100, 1,000 ohms, and at times 10,000 ohms.

If the unknown resistance is equal to the ratio $\frac{A}{B}$, multiplied by the resistance in the rheostat to balance, it is evident that when measuring small resistances, maximum accuracy will be had by making A small and B large, as this will mean a division for the value of the rheostat. If, for instance, we made A 1 ohm, and B 1,000 ohms, and the rheostat value was 67, the unknown resistance would be .067 ohm. If we were concerned with measuring a large resistance, we would place a large value in A and a small one in B. If A were made 1,000 ohms, and B 1 ohm, and the rheostat value was 67, the unknown resistance would be 67,000 ohms.

Having thus familiarized ourselves with the basic principles of the Wheatstone bridge, we will turn our attention to a modification of the Wheatstone bridge, called the slide-wire bridge.

Referring again to Fig. 1, we can reason that it is not necessary to know the actual values of the resistances in arms A and B to determine X, if we know their ratio. Our assumption is that when the bridge is balanced, the voltage drop over A equals that over X, and the drop over B equals that over R, consequently if the parts A and B consist of a straight wire with provision so that one terminal of the galvanometer can be moved

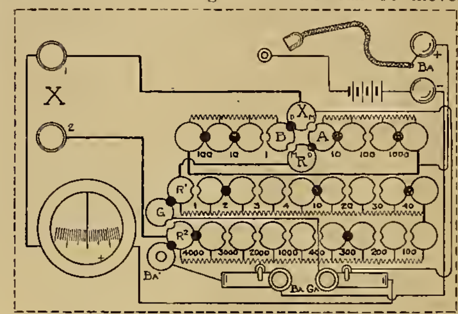


FIG. 2. DIAGRAM OF CONNECTIONS, POSTOFFICE WHEATSTONE BRIDGE

along it for a balance, then the proportional parts of the wire on each side of the balance point can be used for the ratio $\frac{A}{B}$.

It can be looked upon as being a Wheatstone bridge, in which the bridge arms are varied to obtain a balance, and the rheostat has one fixed value for any particular measurement. Since the value of the unknown resistance is determined in terms of the rheostat by the ratio of the bridge arms to each other, it is immaterial whether we express the ratio in ohms, or in length of wire.

Testing Sets

The term "portable testing set" is usually understood to mean some form of Wheatstone bridge, complete with galvanometer and battery, mounted in a carrying case, and arranged for the various tests to which a bridge can be put. There are two types in general use, namely, the plug and dial. In the plug type the resistances are inserted in the circuit by manipulating plugs, and in the latter switches or dials are utilized. A superficial examination of these instruments will not show the relation of the arms, as we have previously discussed them, if one expected to see the same geometrical forms as indicated in the diagrams. An examination of the circuit, however, will reveal the same connections as we saw in the theoretical arrangement. Fig. 2 shows the connections for a Postoffice Wheatstone bridge (a form of testing set often met with in practice).

The manipulation of the bridge is quite simple. The resistance to be measured is connected between the posts marked X and after setting the plugs or switches for measuring resistance as distinguished from fault location, and as given in the directions for using a particular instrument, the rheostat is adjusted until a balance is obtained as indicated by no deflection of the galvanometer.

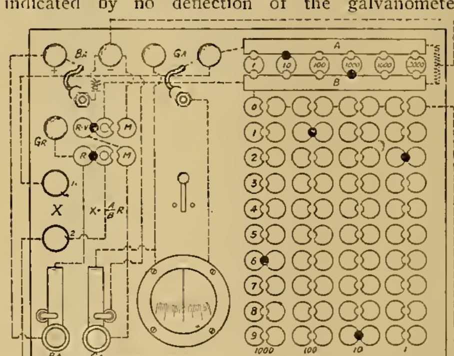


FIG. 3. CIRCUITS OF DECADE TYPE OF WHEATSTONE BRIDGE

The use of the proper values in the bridge arms, in order to get best results for any measurement, is provided for by a table which usually accompanies it.

The instruments constructed on the plug principle are of the Postoffice pattern or "plug-out" method, and the Decade or "plug-in" pattern (Fig. 3). The name "postoffice bridge" is derived from the fact that the general construction was first gotten out by the Department of Telegraphs of the English government, which is under the supervision of the Postoffice. This type is rapidly falling into disuse, due to several objectionable features in the manipulation of the plugs. You will note from the illustration of the Postoffice bridge, shown in Fig. 4, that the plugs are close fitting, which prevents convenience of manipulation. The plugs can be easily mislaid or lost. Another objection is the loosening of an adjacent plug when its neighbor is removed, and which often places a variable resistance in the circuit. In summing up the total resistance in the rheostat, it is necessary to add up a number of odd values, which can readily be a source of error.

The decade plan of resistances has the following special advantages, as can be noted from the illustration in Fig. 5:

A single plug only is required for each row of resistances, which makes it very convenient to manipulate. The resistances are read directly from the position of the plugs. The contact blocks are in pairs, and each pair is mechanically independent of the other blocks. There is consequently no danger that a plug contact will be loosened by removing a plug near it. This is a trouble which must be guarded against in using the rheostats having the 1, 2, 3, 4 arrangement, or the 1, 2, 2, 5 arrangement, by running over all of the plugs to see that they are tightly in position just before making a measurement. On account of the ample distance between the rows, there is no trouble in manipulating the plugs, even when the operator's hands become benumbed by cold or he has to wear gloves.

The dial form of bridge has some advantages over the decade plan, but for all practical purposes, the selection of one type or the other is wholly one of choice.

Portable testing sets on the slide-wire principle do not permit all measurements of resistance to be made to the same degree of accuracy as with the previous types of bridges discussed. They

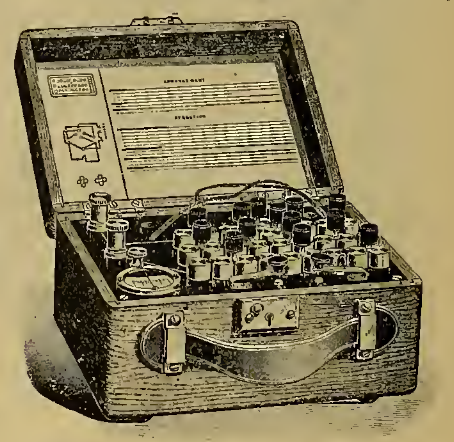


FIG. 4. THE POSTOFFICE FORM OF WHEATSTONE BRIDGE

have the advantage of simplicity of manipulation and are to be recommended when the fault location is to be done by those who are not experienced with the more complex bridge arrangements, or when conditions do not require maximum accuracy. In many makes of this instrument the manufacturers use straight stretched wires, as it is necessary to have a sufficiently long wire to give accuracy of setting. These wires are, however, objectionable on account of their liability to break where soldered, and their use makes an awkward hand stylus necessary for touching the wires.

Classes of Faults

Before considering any diagrams, some general remarks will be in order. The term fault is intended to cover every variety of damage by which the electrical efficiency of a line is affected. Defects which impair the mechanical condition of the line, without affecting it electrically, do not come under the heading. An aerial wire may be penetrated by rust, or a cable sheath may be damaged, without a trace of change in the electrical condition of the line.

The different kinds of faults may be distinguished by the following classification:

Grounds are defective insulation, to ground or to a cable sheath.

Crosses are defective insulation between wires.

Opens are breaks in the conductor, so that two parts are entirely separated electrically.

Inductive crosses result from the transposition of single sides of adjacent pairs.

In speaking of crosses or grounds, it is well to use the modifiers "total" or "dead" and "partial," as a dead ground and a partial cross.

The first step in fault testing is to ascertain the nature of the fault and to give some particular study to the line in trouble by reviewing your knowledge of the line conditions. Having decided

1. A condensation of a paper read before the International Association of Municipal Electricians, Detroit, August 20, 1908.

whether it is an open, a cross, or a ground, the next procedure is to make a location. The Wheatstone bridge is employed for locating a cross or ground by the "loop tests," and so called because it is necessary to have a complete circuit from one binding post of the instrument through the faulty section of the line and back to the other binding post of the instrument. The circuit is called the loop. The different sections forming the loop need

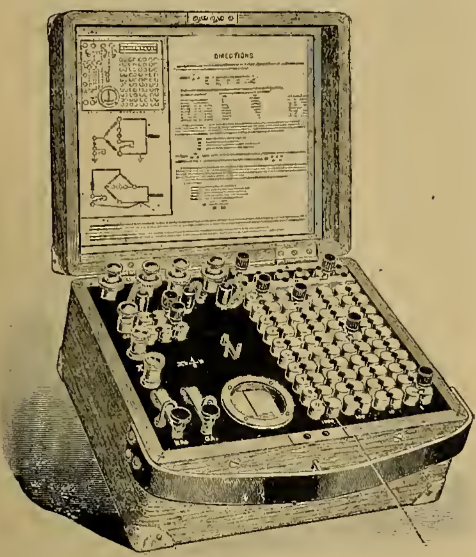


FIG. 5. DECADE FORM OF PORTABLE TESTING SET.

not be of the same sectional area; it is only necessary that there be two independent paths of good insulation from the testing point to the fault. The simplest way to get this loop is to use the mate of the faulty wire, if the wires are in a cable; or, if the wire is an aerial or single conductor in a cable, then we must use an external conductor for a return.

The Murray Loop Test

Referring now to Fig. 6, which represents the connections for the Murray loop, at first inspection we will see an arrangement of conductors exactly like that of the Wheatstone bridge. The wire f t has a fault at F, and is looped to a good wire at J. The loop is connected to the testing set at c and f. The resistances B and R are in the instrument, and form two arms of the bridge, while the section f F of the faulty wire, and the remaining portion of the loop F c, form the other two arms of the bridge. The galvanometer and battery are connected as shown. The current from the battery flows through the earth from the point of grounding at the testing set to the fault. This connection is independent of the resistances forming the bridge, as far as its own resistance is concerned. The earth has a negligible resistance, and while the fault will generally have some resistance, unless it be a dead

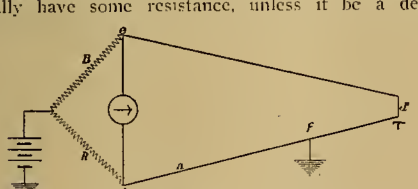


FIG. 6. THE MURRAY LOOP TEST

ground or cross, its resistance corresponds to r' in Fig. 1. Calling a the resistance of the wire from f to F, or the resistance from the instrument to the fault, and r the total resistance of the loop, from the law of the Wheatstone bridge we have:

$$\frac{B}{R} = \frac{r-a}{a} \text{ and } a = \frac{Rr}{B+R}.$$

From the last equation, the distance to the fault may be readily calculated when the values of B and R and the resistances per unit length of the loop wires are known.

Since in uniform wires the resistance is proportional to the length, these equations may also be written, when all the wire of the loop is of one size:

$$\frac{B}{R} = \frac{L-d}{d} \text{ and } d = \frac{RL}{B+R},$$

where L is the total length of the loop, and d is the distance to the fault. This formula should always be used when it is applicable, as it is the most accurate, as well as the most convenient. In using the previous formula, in order to calculate the distance to the fault, the resistance of the wire per 1,000 feet must be determined from a wire table. A slight variation from gauge or a difference of temperature from that assumed may cause a considerable error. Errors from these sources are very largely eliminated when the distance to the fault is determined as a fraction of the length of the loop.

In using a bridge for locating by the Murray loop, it is customary to use a 10,000-ohm coil for arm B, and vary the rheostat until a balance is obtained. This operation, while quite simple, can be made more rapid when using testing sets built upon the slide-wire principle. In using an instrument of this kind, there are limitations in its range, but in its own field of usefulness it is to be strongly recommended.

Referring to Fig. 7, you will note a circuit arrangement similar to that of the slide-wire bridge. You will recall that a contact can be moved along a uniform resistance, and that the ratio was that of the two parts of wire on each side of the contact. Let r equal the total resistance of the loop, and a the resistance from the instrument to the fault, then the formula for solving becomes quite simple, and is:

$$\frac{A}{B} = \frac{a}{r-a} \text{ from which } a = \frac{Ar}{1{,}000}.$$

Another way of analyzing this case is to note the symmetry of the arrangement as indicated in Fig. 7.

It is apparent that if the bridge is balanced with the contact half way between c and f, then the arm f J must equal c J, since A and B are equal, which implies from the law of the bridge that the other two arms must have the same ratio to each other. As the arm B increases and A decreases, so does the distance or resistance from c to F increase, and the distance or resistance f F decrease. Since in uniform wires the resistance is proportional to the length, this formula may be written:

$$\frac{A}{1{,}000-A} = \frac{d}{L-d} \text{ and } d = \frac{A}{1{,}000} L,$$

where L is the total length of the loop, and d is

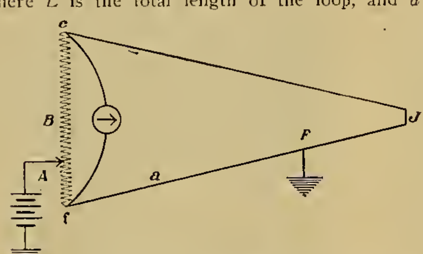


FIG. 7. MURRAY LOOP TEST WITH SLIDE-WIRE BRIDGE

the distance to the fault from f. The last formula is the most convenient, but it is only applicable when the wires have the same resistance per unit length.

The Varley Loop Test

The Varley Loop test differs from the Murray in having a portion of the loop made up of resistance in the testing set, as shown in Fig. 8. The Varley test can be most usefully applied in those types of bridges which permit of making the ratio of A to B unity, or 10, 100, 1,000, etc. In these cases the ratio of A to B is fixed and R is varied until a balance is effected. Calling r the resistance of the faulty wire f J plus that of the wire c J and a, the resistance from f to the fault, we have:

$$\frac{A}{B} = \frac{r-a}{R+a} \text{ and } a = \frac{Br-AR}{A+B}.$$

The formula for the Varley loop admits of several modifications, which will not be given at this time, for lack of space.

If the fault in a grounded or crossed conductor were always of practically infinitely low resistance—that is to say, if it were a "dead" ground or

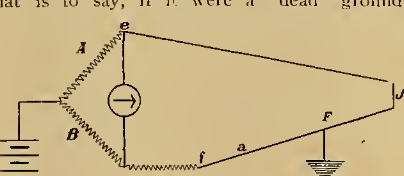


FIG. 8. THE VARLEY LOOP TEST

short-circuit—its location could easily be detected by measuring the resistance from the point of test, and back again through the ground, or through the other conductor affected by a regular resistance test. Unfortunately, however, it is seldom the case that this condition exists, and tests giving results independent of the resistance of the return circuits and at the point of trouble are therefore necessary.

The loop tests, you will note, fulfill these requirements. The only effect a high resistance will have upon our test will be to reduce the electromotive force of the battery, so that in very high resistance faults it becomes necessary to employ 50 and 100 cells, so as to impress the electromotive force through the fault, so that the galvanometer will have sufficient sensibility.

The Location of Opens

When a conductor is actually broken and there is no return circuit from the break, a new set of conditions must be considered. In locating the break, we depend upon the fact that every conductor, whether it is in a cable in the earth or submerged in water, or is an air wire, possesses "capacity" and is in fact a condenser. The conductor itself forms one plate, the insulation from the point of test to the break the dielectric, while the other plate is the earth, water or lead sheath.

This capacity is generally proportional to the

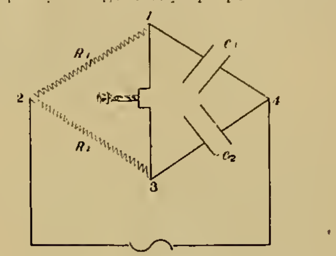


FIG. 9. CAPACITY RESISTANCE BRIDGE

length of the conductor, so if we know its capacity per unit length, and measure the capacity up to the break, we can calculate the length of the conductor to the break. This method is open to the objection that the capacity cannot always be relied upon as uniform throughout the length of the wire, variations of 10 per cent. or more often occurring. In measuring the capacity by this test, the deflection method is used, in which the cable is charged to a certain potential, and the discharge is then read by means of a deflecting galvanometer. The deflection, however, is liable to be augmented through the action of what is called "electrical absorption," which produces return currents after the true discharge of the condenser capacity is over. This phenomenon takes place to greater or less extent with all cables, and increases with rise of temperature.

A method which largely removes the above objections, and at the same time can be performed by a simple bridge arrangement, with the addition of a telephone receiver and reversed battery current, is to compare the capacity of the open wire, from the point of test to the open, with the capacity of the good mate of known length.

Referring to Fig. 9, if the capacities of C_1 and C_2 (represented by the conventional symbol of parallel lines) are the capacities of an open wire and its good mate, respectively, we can balance the two capacities against R_1 and R_2 in the other two arms of a Wheatstone bridge. Instead of a galvanometer and battery, a telephone and a source of alternating current are shown in Fig. 10. When the resist-

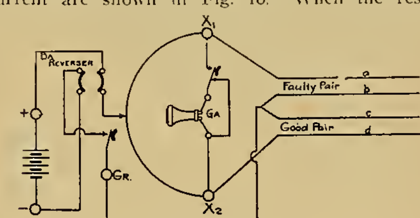


FIG. 10. LOCATION OF "OPEN" BY COMPARISON OF CAPACITIES

ances are adjusted so that no sound is heard in the telephone, then the points 1 and 3 are equal in potential. The cable capacities represented by C_1 and C_2 are then charged to the same difference of potential and contain quantities of electricity proportional to their capacities; but the quantities flowing into the condensers in the same time are inversely proportional to the resistances R_1 and R_2; therefore,

$$\frac{R_2}{R_1} = \frac{C_1}{C_2}.$$

Since the good and bad wires are under similar conditions, their lengths may be taken as proportional to their capacities. Hence, if L_1 and L_2 represent the lengths of the bad and good wires, then

$$\frac{R_2}{R_1} = \frac{L_1}{L_2} \text{ or } L_1 = \frac{R_2}{R_1} L_2.$$

The question of allowance for lead wires does not enter, unless the leads are very long or a wire in a cable is used for a wire leading to the faulty cable.

Having thus become acquainted with the theory

[Continued on page 194.]

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

IN THE INVESTIGATION into the ultimate composition of the matter of which the universe is composed the question is often asked whether the ether of space is to be considered as a material or form of matter. Sir Oliver Lodge, in a recent lecture, answered this by saying that, while this is largely a question of words and convenience, he would prefer to say that the ether is not "matter" at all. He thinks that the essential distinction between matter and ether is that matter moves, in the sense that it has the property of locomotion and can effect impact and bombardment, while ether is strained, and has the property of exerting stress and recoil. "All potential energy exists in the ether. It may vibrate, and it may rotate, but as regards locomotion it is stationary—the most stationary body we know—absolutely stationary, so to speak; our standard of rest." As only matter can be moved, it follows that the distortion of a spring, for instance, is really distortion of the ether; the atoms of the steel are not strained, only displaced by the strain on the ether, which is the connecting link between them.

NOT INFREQUENTLY the medical journals revert to the danger of infection from talking into a public telephone. To overcome this apprehension a number of antiseptic mouthpieces have been fitted to transmitters. These usually contain some disinfectant that at the same time gives a pleasant odor to the mouthpiece. Where these are not provided a simple remedy has been suggested by Mr. Rosser S. Dean, who, writing in an English paper, says: "There has been some talk about danger of infection from the use of public telephones. May I suggest a simple contrivance by way of safeguard for those who care to use any? Fit a piece of thin but tough paper (good typewriting paper does well) over the mouthpiece of the transmitter, so as to form a little tight drumhead to it. If the paper be strong enough it will suffice to crumple it tightly round the neck of the cup, but a small elastic band holds better. The paper is fitted in a few seconds and removed as quickly. The user speaks against it, but without touching it. I do not find that the transmission of the voice is interfered with in the least. The idea is not mine, for I saw something of the kind on a neighbor's telephone and promptly adopted the idea for home use, but I think it will be new to most people, and may be welcome to some."

By actual trial on a fairly good telephone line it will be found that this paper scheme does not appreciably detract from the clearness of the voice, if the paper is put on tightly and is not too thick or too thin. A little pad of the paper can be readily carried by anyone willing to go to a slight inconvenience to allay nervousness in the use of a great public utility. While the bulk of the public enjoys the use of the telephone without trepidation, those who are scrupulous in this respect will probably find comfort in adopting the paper protector.

UNIPOLAR DYNAMOS are ideally simple machines for producing a non-pulsating direct current. Their development, from the experimental disk dynamo of Faraday to the modern commercial machine has been an interesting triumph over the limitations to which the acyclic generator is subject. While one of the earliest forms of the dynamo-electric machine, the progress of the unipolar type had not, until comparatively recent years, kept step with the development of the commutating dynamo. Difficulties of obtaining the high speeds necessary in a reasonable field strength, and the problem of collecting the large currents at the low voltages for which the machine is particularly adapted, while the armature collector rings were traveling at such an extreme velocity, have tended to hold the unipolar machine behind the general progress that has occurred in electrical generators. But the advent of the steam turbine, with its high rotative speeds, has resulted in a revival of interest in the possibilities of the homopolar design, until now this type of generator, which might only have been hoped, a few years ago, to supply large low-voltage currents for electrolytic and metallurgical service, has taken a place in the power and light field, supplying current at pressures ranging up to 600 volts.

To the electrical man familiar with the commutating dynamo, the new types of the acyclic machines will present some anomalies. Conductors such as are usually employed in armatures do not exist, and in the armature are loose contacts, made necessary by the expansion of the long collectors, which depend upon the high centrifugal strains during operation for maintaining a good electrical contact.

At the peripheral speeds of the order of 25,000 feet per minute at which the current is collected it was necessary to devise a new two-metal brush, as the ordinary copper brush would wear several inches during a day's operation.

Overloads of 200 per cent. and more have been carried by these new generators without affecting the working, and heavy short-circuits in the external circuit have caused no damage to the machine. Contrary to the first assumptions, recent high-speed experimental machines have shown that the losses due to the collection of current increase only slowly with increase in speed after the higher speeds are attained. Incidentally, the high speeds result in increased ventilating facilities.

IT IS REASONABLE to suppose, from the fair degree of success attained by tests in different parts of the world, that the airship or flying machine, preferably the heavier-than-air type, rather than the dirigible balloon, will in the future be of practical service to mankind. This is a fact of immense importance, of course, and is of very wide and general interest. Readers of the Western Electrician are interested in the airship, not only because everybody is interested, but because they are in intelligent sympathy with the development of mechanical engineering, with which electrical engineering is so intimately connected, and, more specifically, because it is probable that mechanical flight will bring with it a great extension of the usefulness of that comparatively recent and ever fascinating branch of electrical science—wireless communication.

Pre-eminent among those who have achieved success, or a measure of success, with the aeroplane are Orville Wright and Wilbur Wright, brothers, of Dayton, Ohio. The work of these men has attracted the attention of the civilized world; and they have won unbounded praise. Very recently Wilbur Wright in France and Orville Wright in the United States have given public demonstrations which have been remarkably successful. The tests at Le Mans, France, seem to have convinced the most skeptical abroad. The London Times Engineering Supplement, in its issue of August 26th last, gives prominence to a long article from a correspondent on "The Wright Aeroplanes," in which it is said that "The story of the efforts of Wilbur and Orville Wright to effect the mastery of the air is one that commands respect from all Englishmen. * * * The result—the successful accomplishment of mechanical flight—has proved their methods to the hilt, and no two human beings ever more honestly deserved the reward they are about to reap than the Brothers Wright."

In the flights given last week and this week at Fort Myer, Va., near Washington, under the requirements of the Signal Service of the United States Army, the results were hardly less remarkable. In this instance the Western Electrician has its information at first hand, for Mr. Frank L. Perry, a member of the staff of this journal, was present, and he has written for the benefit of the readers of the paper an exhaustive illustrated account of this most modern of modern developments under the title "The Wright Aeroplane and Wireless Communication." Mr. Perry is himself an experimenter with "wireless," and he is therefore well fitted to consider the possibilities which the airship presents in this direction. But he has not forgotten that very many readers, who make things with their hands and work out mechanical ideas in shops or laboratories, will be intensely interested in the mechanism and operation of the aeroplane itself, with its apparatus for utilizing the reaction of the air for support and with its driving and steering gear. Therefore, with the countenance of Mr. Orville Wright, the writer will in a future issue describe and illustrate the aeroplane and describe carefully and he believes correctly "how it flies."

The Western Electrician has been to some pains to send its representative to this government test at Washington. The resulting article, begun in this issue, will be published in four parts, and we trust that all readers will find it not only interesting but instructive as well, describing, as it does, one of the latest and greatest applications of human ingenuity.

WESTERN SOCIETY OF ENGINEERS

A session which was one of the most interesting ever held by the Western Society of Engineers, as several members observed, marked the opening of the society's new quarters on the seventeenth floor of the Monadnock Block, Chicago, on September 2d. The rooms of the society have been remodeled and greatly enlarged, and the commodious quarters on the top floor of the building now include a spacious reception room with comfortable leather-upholstered chairs and a complete current file of the engineering and technical magazines, a large corridor for the book shelves containing the society's library, the officers' rooms, and a large assembly hall, which is almost a model of its kind. An especial feature of the latter assembly room is the illumination. With the exception of several ornamental chandeliers, which are not lighted when the room is serving its purpose as an assembly place, all the light sources are out of the line of vision of those sitting in the audience. The audience section is lighted by a number of incandescent lamps placed above a large diffusing skylight, so that the illumination is almost as free from shadows as daylight from an open sky. The rostrum is well lighted by hidden reflectors. The stereopticon lantern is operated from a gallery at the rear of the hall. A plan of the society's new quarters was given on page 470 of the Western Electrician of June 13th.

The subject for the evening was "The Analysis of a Hydro-electric Project," presented by Mr. H. von Schon, formerly the chief engineer of the Lake Superior Power Company. His paper, which was a very careful engineering and cost study of hydro-electric developments, particularly those under 5,000 to 8,000 horsepower, will appear in abstract in a subsequent issue of the Western Electrician.

Advance copies of the paper had been sent to members, and L. K. Sherman, by letter, opened the discussion by directing attention to the necessity for examination of the stream flow itself, and expressed his own doubts of the close relation between the rainfall of the government reports and the run-off. In reply, Mr. von Schon recounted his experience in the case of some work done on the Kentucky River near Frankfort. Here gaugings had been taken three times a day for 50 years, and Mr. von Schon had these results plotted as a curve, meanwhile making a similar curve of the rainfall during the period. As a result, he said, the two curves were almost identical except for a small discrepancy in the winter months.

Mr. von Schon then exhibited an interesting series of lantern slides, showing the process of construction of a power plant, contained within the dam itself, on the Patapsco River, 17 miles from Baltimore. The first view showed the bare foundation and the last picture the heavy rush of the water over the crest. The placing of the power house within the dam is one of the most modern and efficient expedients, and the speaker explained that if the structure was dependable as a dam, it certainly should be as a power house. The power house occupies only a part of the width of the dam, and so dry is the atmosphere within the generator room that sprinkling the floor has to be resorted to. An air space is built between the water wall and the power-house wall, and the circulation of air is insured by inserting down-pointing air vents in the downstream side of the station. These, due to the diminution of pressure caused by the falling water, produce a noticeable suction on entering the power house, the speaker said.

Lyman E. Cooley took the occasion to impress the collateral advantages which must follow hydro-electric development, among which he enumerated inland navigation, forest preservation, avoidance of floods, and the creation of great reservoirs for recreation, etc.

W. L. Abbott urged that the steam turbine had so reduced the initial and operating costs of the steam plant that the hydro-electric promoter must go carefully where cheap coal is available. He advised the use of steam as the auxiliary of the water plant to carry the changing loads, on account of its flexibility.

Mr. von Schon was very emphatic in his answer that he believed a hydro-electric plant could be operated more cheaply than a steam plant of the same size, even if the coal cost nothing, and spoke of the expense and trouble of handling the coal and ashes. His statement that he could supply any city with economical water-generated power was challenged by several members, who named a list of such cities, as Cincinnati, New Orleans, Milwaukee, etc. They were rewarded with a detailed rapid discussion of the power possibilities for each city they had named. Mr. von Schon thinks the transmission of power to long distances is but a question of voltage, and was not disposed to be conservative in his predictions for the future of hydro-electric development and power transmission.

PRIZE LAMP-POST DESIGNS FOR CHICAGO BOULEVARDS

Awards in a competition for concrete lamp posts conducted by the members of the Chicago Architectural Club for the Lincoln Park system of Chicago have been made in favor of the three designs shown on this page. The three prizes, of $75, $40 and $20, went to Charles C. Rich, Elmo C. Lowe and Herbert J. Naper, in the order named. Ten designs were submitted.

These lamp posts are proposed by the Lincoln Park board as ornaments to the parks and boulevards of the North Side. The conditions called for a post with an interchangeable top, which could carry a globe, either directly on top of the post or suspended to a projecting bracket, the center of the light to be 15 feet from the ground.

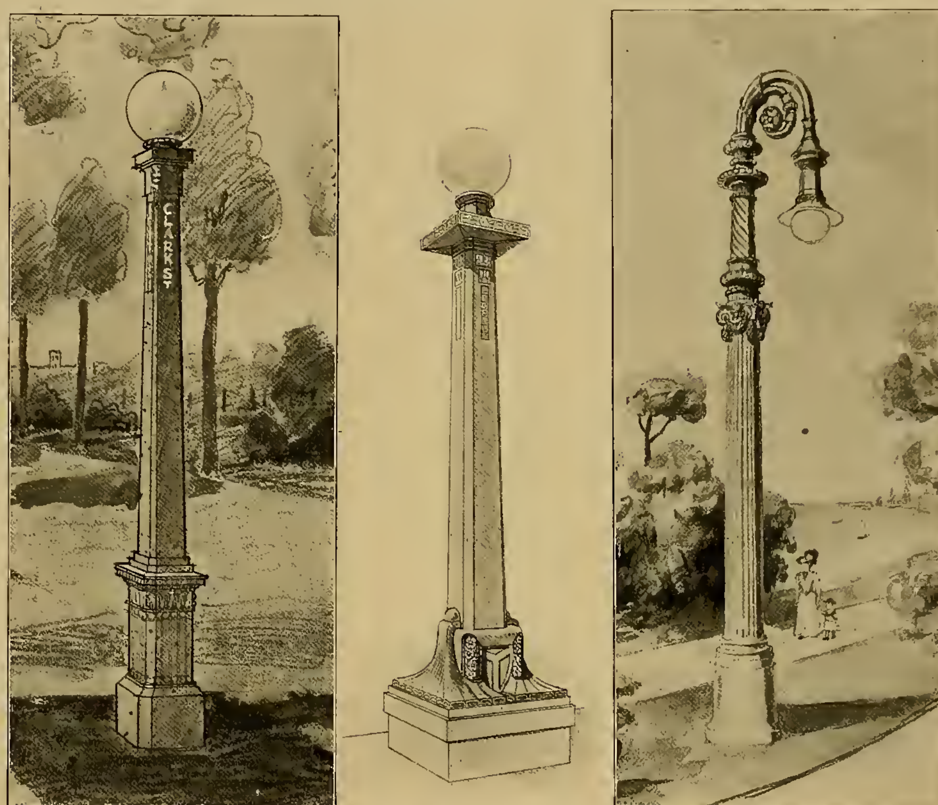
The minimum diameter of the shaft was to be not less than six inches and of the base not less than 16 inches. Provision was required for introducing the names of the streets where there might be intersections. One of the difficulties was to find some means for crowning the shaft with a finish and still not place a wide plate under the light which would shroud the post and the street sign in shadow.

In the first-prize design is shown a reasonably light shaft, tapering and crowned with a small square cap. There are reliefs at the corners to make the transmission from shaft to cap, the ornamentation being neat. Also there is a somewhat ornamented name-plate in a perpendicular line, all kept flat. The base is a simple enlargement of the shaft and it is neatly ornamented.

The second-prize design is a perfectly plain shaft, square with beveled corners. Again a small square cap is set directly on top of the shaft, with only a flat ornamental band. The base spreads three feet and is of convex flutings on two sides and simple ornament on the other two.

In the third-prize design there is a renaissance Ionic capital over a fluted column. The capital is kept small.

The jury of awards consisted of J. L. Hamilton; Myron H. West, Lincoln Park superintendent; J. W. Pattison; E. H. Bennett and President Hammond of the Architectural Club.



First Prize Second Prize Third Prize

PRIZE LAMP-POST DESIGNS FOR CHICAGO BOULEVARDS

ELECTRICAL EXPORTS FOR JULY

The electrical exports from the United States during July show a slight falling off as compared with the totals for the preceding month of June, while presenting a marked decrease compared with those of July, 1907. The total exports for July, 1908, were valued at $952,435, compared with $1,580,995 for July of last year and $1,081,229 for the month of June of the present year. As classified into appliances and machinery the totals were: Electrical appliances—July, 1908, $429,080; July, 1907, $694,938; June, 1908, $421,732. Electrical machinery—July, 1908, $523,355; July, 1907, $886,057; June, 1908, $659,497.

The principal countries to which electrical products were exported during July, 1908, were:

Electrical appliances—British North America, $104,166; United Kingdom, $68,805; Argentina, $41,552; Brazil, $41,160; Mexico, $32,170; Cuba, $23,946; Japan, $21,700; Central America, $20,374; British Australasia, $16,926; other South America, $15,517; Philippine Islands, $11,110; Belgium, $9,871; Germany, $6,735; other Europe, $3,498; British Africa, $2,688; other West Indies and Bermuda, $2,409; France, $1,489.

Electric machinery—British Australasia, $75,301; other South America, $61,083; Mexico, $59,583; Brazil, $58,617; Japan, $49,377; United Kingdom, $45,215; British North America, $33,514; other Europe, $25,591; Argentina, $22,102; British East Indies, $18,310; other Asia and Oceania, $16,652; Cuba, $16,364; France, $13,346; other Africa, $7,485; British Africa, $7,350; Mexico, $6,024; Germany, $4,647; Philippine Islands, $2,172.

GASOLINE RAILWAY TO BE ELECTRICALLY EQUIPPED

Between Kansas City and Olathe, Kan., the Missouri and Kansas Interurban Railway Company (now in the hands of Mr. J. A. Edson, receiver) has operated a railway 22 miles long, known as the Strang line. The motor cars were driven by gasoline engines, but although the road has been in operation only a year or two this method has not proved satisfactory, and the line is now being equipped for electric overhead-trolley direct-current service by The Arnold Company of Chicago.

PRINCIPLES OF FAULT LOCATION

[*Continued from page 191.*]

of the two loop methods, and the method for locating opens, we will consider some matters of a general character which must be observed, so that accuracy may attend your results.

In the use of testing apparatus, it is of primary importance that good electrical connections be made throughout the circuit. Attention must be paid to the cleanliness and the firm binding of all wires and leads. If one is to rely upon an inexperienced assistant for making joints and connections on poles and elsewhere, much annoyance may be experienced. This matter of good connections cannot be emphasized too much, as any resistance caused by poor connections in the loop circuit will enter directly as an error in the location. If, for instance, the assistant does not make a good connection in joining the good and faulty wires, but introduces a resistance of one-fourth ohm, where the wire is No. 22 B. & S. copper, the location will be 16 feet in error. Proper care, therefore, will be immunity from many troublesome derangements and failures, the causes of which are usually discovered after much loss of time and labor.

Foreign Currents

A source of inconvenience and error lies in the fact that at the fault there may exist an electromotive force due in some instances to the contact potential difference between the faulty conductor and that on which it is grounded. Not infrequently stray currents are flowing on your wires from light and power circuits, or are induced from such circuits. These currents are generally irregular and cause irregular deflections of the galvanometer. Where they occur, the battery should be made as large as possible, so that the galvanometer deflections due to the test current may be larger than those due to the stray current. If this precaution does not make it possible to make sufficiently accurate location, it may be necessary to make use of another loop or postpone the test until conditions are more favorable.

A Disappearing Ground

A disappearing ground is occasionally encountered while trying to locate a fault. This is generally caused by the battery current from the testing set turning a slight moisture ground into gas. Sometimes, by waiting for a short time, the ground will reappear. By employing more battery, so as to get a higher voltage, and taking a quick reading, it is sometimes possible to catch a location. It may be advisable in these cases to interchange the galvanometer and battery. When this is done the galvanometer current only flows through the fault, and it is much less likely to dissipate it than the battery current.

Sometimes the ground can be increased or permanently burned out by applying a ringing generator to the faulty wire. Before doing this, disconnect the testing apparatus.

If these methods are unsuccessful, it is best to leave the trouble until it becomes worse. A ground that is sufficient to make a line noisy, can, as a rule, be located.

Inequalities in Line Resistance

All fault locations by loop methods are based on the assumption that the wires have a uniform resistance per unit length. This is never exactly true, and is sometimes very far from true. Unless the wire inequalities balance each other, which they do in many cases, the calculated location will be in error exactly in proportion to the inequalities. Among the causes of inequalities are introduced resistances, such as poorly soldered sleeves, slight variations in gauge, and inequalities in the temperature of different parts of the line. It is generally impossible to correct for these inequalities. In the cases of long lines, where there are considerable inequalities in temperature, the resulting resistance variations may be calculated and allowed for.

Another cause of inequality is unequal twisting of a wire in a cable. For this reason the loop should be made whenever possible by connecting the faulty wire to its mate, as the two will then be subject to the same conditions of twist, temperature, etc.

Incorrect Assumptions in Regard to Line Resistance

If calculations are based on resistances determined from the wire gauge and wire tables, errors may occur, due to all of the causes mentioned in the preceding paragraph. This class of errors may be obviated by using the methods and formulas which determine the distance to the fault as a fraction of the total length of the loop of the faulty wire. For this reason these methods are always to be preferred, when they are applicable. They are, however, only applicable when the good and faulty wires are the same length and gauge.

On lines where a source of trouble is suspected as being due to poor joints, it is well to measure the resistance of the line from point to point, and compare the results with the correct resistance per unit length.

Correction for Lead Wires

It sometimes happens that the testing instrument cannot be placed directly at the cable ends, and it then becomes necessary to employ leading wires between the testing set and cable. When such is the case, it is simplest to use the leading wires of the same size as the faulty wire. Then the length of these leads must be added to L, the combined length of the good and the bad wires, and from the calculated distance to the fault must be subtracted the length of the leading wire connected to the faulty wire. If the leading wires are different in size from the cable wires, multiply the length of each of the former by its rated resistance per 1,000 feet and divide the product by the rated resistance per 1,000 feet of the size of wire in the cable. The values thus found represent the equivalent length of cable wire having a resistance equal to each leading wire.

If the resistance of each leading wire is known the equivalent length of the faulty wire having a resistance equal to each leading wire is found by dividing their respective resistances by the rated resistance per 1,000 feet of the faulty wire, multiplying the quotient by 1,000.

Lead Wire of Unknown Resistance

Occasionally it may be necessary to employ fixed leading wires whose separate resistances are unknown. The individual resistances of the wires may be obtained most easily by connecting them at the distant end and measuring the resistance of the loop. Then ground the connection and apply either the Murray or Varley loop test. This will give the proportion of the total loop resistance in each wire.

Before concluding the subject of the paper, some reference will be made to a few tests which are necessary as a preliminary to using the bridge for localization.

Tests for Opens

To test for broken wires, the conductors should all be grounded at one end of the cable, and the test applied at the other end in the following manner: Ground one side of a battery to the lead cover of the cable and connect the other side to a galvanometer, voltmeter, electric bell or telephone receiver. The wire running from the other side of the instrument used should then be touched consecutively to every wire of the cable. No indication of an electric current is evidence that the wire under test is broken.

Test for Crosses

In testing for crosses, bunch all the wires, and connect them to one end of a testing circuit, such as is described above; then remove, one by one, the wires bunched, touching each successively to the other end of the testing circuit. The indication of an electric current shows that the wire touched is crossed with one of the other wires; the wire should then be marked and connected to the bunch and the test repeated until nothing is left but crossed wires, when it is easy to determine between which wires the crosses exist; care must be taken to see that none of the wires are in contact with each other, or the lead cover at the far end of the cable.

Crossed wires are located by the same methods used for grounded wires, except that the binding post on the instrument, instead of being connected to ground, is usually connected to the wire crossed with the faulty wire. When this is not convenient ground the wire crossed on the faulty wire and connect the ground post to ground as usual.

Test for Grounds

Grounded wires may be detected in a cable by connecting a galvanometer in series with a battery, one pole of which is grounded. Connect the wires, one after another, to the other galvanometer terminal. A deflection shows a faulty wire.

This test can also be made with a telephone and direct-current magneto. The reversed-current magneto is not thoroughly reliable, because it will ring when the electrostatic capacity of the wire is sufficiently large. However, with it, in the hands of an experienced man, low-resistance faults can immediately be detected by the loudness of the ring and the resistance to rotation of the handle.

It is sometimes desirable to measure the resistance of the fault in order to determine how accurately a location may be made. This may be done by various methods. When the fault resistance is not high, it may be measured in the same way that conductor resistance is measured. When the fault resistance does not exceed 1,000 ohms, satisfactory locations can be made with a few cells of battery and the ordinary testing-set galvanometer. For higher resistances, additional battery will be required, and for very high resistance faults it is necessary to use a sensitive reflecting galvanometer.

Of importance equally as great as that of locating a fault after its occurrence, is to make systematic tests upon one's lines, so as to foretell the occurrence of such defects. The use of high-class insulated wires, both for overhead and underground cables, has increased to such an extent in recent years that I feel we are not realizing the importance of making systematic tests in order to maintain as high an efficiency as we should. This necessity of testing is especially true in the case of those who have charge of so vital a system as police and fire circuits.

QUESTIONS AND ANSWERS

OHMMETERS

D. G. S., Grand Rapids, Mich.: What is an ohmmeter, what is its principle, and how is it used?

Answer

An ohmmeter is an instrument for measuring the resistance of a circuit which usually indicates the number of ohms directly by the movement of a pointer on a scale. The principle of most ohmmeters is that the current passing through a circuit upon which a constant direct electromotive force is impressed is inversely proportional to the resistance and that, therefore, if a current-measuring instrument, such as a galvanometer, is placed in the circuit, its deflection will be an inverse measure of the resistance. By calibrating and marking off the galvanometer scale backward, i. e., with low values of ohms at the extreme position of the needle and high values up to infinity at the initial position of the needle, the instrument will indicate ohms directly. In making any tests with such an instrument great care must be taken to have always the same voltage applied to the test circuit as was used in the calibration, otherwise the scale readings are incorrect. Ohmmeters are generally used for making rapid measurements of moderately high resistances where extreme accuracy is not essential.

Some instruments that have been somewhat erroneously termed ohmmeters do not work on the principle above described. These are really slide-wire Wheatstone bridges which have the scale underneath the slide-wire marked off in ohms instead of in length units. Thus when using a particular one of the fixed resistances, the corresponding scale values must be used. These instruments do not permit of such rapid measurements as the galvanometer type referred to above. The slide-wire ohmmeter is used like any slide-wire bridge and has the advantage that an alternating current and a telephone receiver may be used as the current source and current-detecting means, respectively.

DROP IN VOLTAGE OF EXCITER

C. H. S., Bendsville, Mass.: We have at our plant two direct-current exciters, one driven by an induction motor and the other by a steam turbine. They are wired to the switchboard so that we can run either one at a time or both in parallel. When we start either machine, say, the motor-driven exciter, we can easily get 150 volts on the voltmeter with the exciter switch open. On closing this switch the reading drops to nearly 130 volts. On starting up the turbo-exciter set we get a correct reading (150 volts), whether its switch is in or out. The voltmeter is connected so as to be in common use for both machines. What causes the exciter voltage to drop when only one machine is running?

Answer

In all likelihood the load is too heavy for one exciter alone, so that its internal voltage drop becomes excessive. As exciters are frequently shunt wound, there may follow a drop in voltage on throwing on their load. This becomes greater as the load is increased, and it also becomes greater if the speed of the driving motor drops, as it would if it were too small for the exciter. On starting up the other set and leaving it on open circuit, the voltmeter indicates a voltage value between that of the two machines, since it is connected to both. On putting the machines in parallel the voltage will be about right, because the heavily loaded machine is now relieved of its excess load and its voltage rises, while that of the turbo-exciter drops to the average value on picking up its load.

JOINT POLE LINES FOR LIGHTING AND TELEPHONE CIRCUITS[1]

By Paul Spencer

Part I.

At the twenty-ninth convention of this association held at Atlantic City in June, 1906, the writer presented a paper on "Line Construction."[2] In the specification that was made a part of that paper attention was called to the importance of giving consideration, not only to the construction of an electric-light company's own lines, but also to that of any other overhead lines existing in the territory. Certain broad principles were stated as necessary for safe construction where electric-light lines were to be built paralleling existing lines, or where poles were to be jointly used by electric-light and telephone companies.

It is the purpose of this paper to elaborate this phase of the line-construction problem, and to present a detailed specification for the joint use of poles, which was recently prepared for the Public Service Corporation of New Jersey and for the New York and New Jersey Telephone Company by a joint committee representing the two companies. This committee consisted of Mr. John A. Barrett, electrical engineer of the American Telephone and Telegraph Company; Mr. Bancroft Gherardi, then chief engineer of the New York and New Jersey Telephone Company, as representing the telephone company, and Mr. Dudley Farrand and the writer as representing the electric-light company.

It will, I think, be conceded by every electric-light superintendent that the presence of the overhead wires of a telephone company in his territory constitutes a troublesome factor in his line construction. It is had enough to have to dodge trees, irate property owners, and other obstacles in the construction of a well-built line, but the presence of the lines of the telephone company, occupying perhaps the only clear side of a street, renders the situation still more difficult. We must, however, recognize the fact that the telephone companies have as much right as we have to decorate the landscape with poles and wires, and that such poles and wires have the same justification for their existence as ours, namely, the convenience of the public, whom both companies serve.

All companies that maintain overhead service in the same territory should recognize that it is to their mutual interest that the lines of all should be so built as to enable each to supply satisfactory service to the community, and especially so built that the possibility of accident to the public, or to the employes of the companies, may be reduced to a minimum.

Unfortunately, in the past enough consideration has not been given, either by the electric-light companies or by the telephone companies, to the overhead construction as a whole and as affecting both companies. Electric-light and telephone lines are frequently built apparently regardless of the presence of other construction in the territory, and of the possibility of the wires of one company coming in contact with those of another through the occurrence of some unusual accident. There has, therefore, been in the past a relatively large number of accidents to persons and property, some of which could undoubtedly have been avoided had the construction of the two companies involved been carried out at the start so as to guard against the possibility of accidental contact.

It is, therefore, not sufficient that the overhead construction of an electric-light company shall itself be made as strong and safe as possible, but it is also necessary that no other company in the same territory shall be permitted to carry on its construction so as in any way to bring about a condition that may be a menace to the safe and uninterrupted operation of the electric-light company's lines.

As telephone lines exist in all territories occupied by electric-light companies, it therefore becomes almost a matter of necessity that the two companies in a given territory should come to an agreement, or, at any rate, to some working understanding, as to the method of carrying on their construction so as to avoid possibility of accident.

It was an appreciation of the necessity of reaching such a working understanding that led to the drawing up of the detailed specification that is attached, covering the method of construction on poles that might be jointly used by electric-light or telephone companies. In the preparation of the specification certain general principles were conceded by both the representatives of the electric-light and of the telephone companies.

It was agreed that the joint use of poles was to be avoided wherever possible; that is, that each company should use its utmost endeavors to obtain a clear and unobstructed right-of-way of its own, making its extensions on its own poles, and not making attachments to the poles of the other company, even where agreements existed which permitted such attachments. Separate and non-conflicting pole lines were considered to be of the first importance.

It was, however, recognized that separate lines, however desirable, would not always be possible. There are only two sides to a street, and in some cases municipal restrictions, or at least the insurmountable objections of property owners, would make a line of poles on each side of a street impossible. In such a case, if it should be necessary for the telephone company and the electric-light company each to have an overhead line along the street, only two courses would be open—either to build two lines of poles on the same side of the street or to build one line of poles capable of carrying the lines of both companies, and to have the two companies jointly use such a pole line. It was agreed that in all such cases joint use of the same pole line, under proper restrictions, was in every way preferable—on the grounds of safety of construction, as well as on the grounds of appearance—to parallel the conflicting pole lines on the same side of the street. Joint use of poles, therefore, under such special cases was deemed necessary, and the specification was prepared defining the restrictions under which the attachments, when permitted, should be made.

It may be objected that many of the clauses in the specification are such as to increase the expense of line construction and to increase the cost of making attachments to the poles of other companies. This is true; but a joint pole line, even if constructed at a considerably increased expense, will still cost less than the construction and maintenance of separate pole lines, and there was no desire in drawing up the specification to render it easy to make such attachments on the ground of reduced expense. Extensions should never be made on existing pole lines of another company in order to save the cost of putting up a new line of poles, but only where additional safety can be obtained by so doing, rather than by building separate lines that would parallel and conflict with the existing pole lines.

Specifications for Construction on Poles Jointly Used

I. *Introduction.*—These specifications shall be understood as applying to poles jointly used by telephone wires and attachments and electric-light and power wires and attachments of character and voltages as hereafter defined.

For the purposes of these specifications the terms electric-light wires, electric-light lines, electric-light attachments, fixtures, poles, property or service shall be taken to include both lighting and power systems within the class to be defined; and the term lighting company or electric-light company shall be taken as referring to the company owning or operating such systems.

II. *Line Wires on Cross-arms.*—All line wires on poles jointly used shall be carried on insulators and pins on wooden cross-arms and not on brackets; insulators to be of a type suited to the service of the company whose wires they support and of a type to secure the service of the other company against injury in so far as practicable; excepting that telephone lines in aerial cable or in insulated wire may be carried upon a suspension wire attached to the pole as provided for in Article X.; and excepting that telephone wires for local distribution to subscribers' stations may be carried on special fixtures, either upon cross-arms or attached directly to the pole, provided that where such telephone fixtures are below electric-light wires or attachments the telephone bridle wires shall be insulated with a standard rubber compound, or its equivalent, and covered with at least one thickness of braided or woven covering; and provided further that such telephone wires and fixtures shall not obstruct the proper occupancy and use of the pole by the lighting company as secured by the succeeding articles of this specification.

III. *Electric-light Line Wires to be Above Telephone Line Wires.*—Electric-light and telephone wires shall not be attached to the same cross-arm.

The wires and attachments of the lighting company shall be carried above the wires and attachments of the telephone company, and the wires and attachments of the telephone company shall be carried below the wires and attachments of the lighting company; excepting as hereinafter specially provided; and excepting that by mutual consent in particular instances the reverse position may be employed; the proposal and consent for such reversal of position to be in writing and to be approved by an officer on the part of each company.

IV. *Space Between Electric-light Cross-arms and Telephone Cross-arms.*—One standard pole gain shall be left vacant between the nearest cross-arm occupied by the lighting company and by the telephone company, respectively; and in every case a vertical distance of not less than 40 inches shall be provided and maintained between the wires and connections of the lighting company and the wires and connections of the telephone company, excepting that cables, service wires, connecting wires and ground wires may be run vertically upon a pole when located and protected as hereinafter provided in Articles XII. and XIII.

V. *Size of Line Wires.*—Where the cross-arms carrying the telephone wires are located above the cross-arms carrying the electric-light wires, the telephone wires carried thereon shall be of hard-drawn copper wire and of a size not less than No. 12 B. & S. gauge for a single wire and No. 14 B. & S. gauge for each wire of a twisted pair.

Where the cross-arms carrying the electric-light wires are located above the cross-arms carrying the telephone wires, the electric-light wires carried thereon may be of medium soft-drawn copper and shall be of a size not less than No. 6 B. & S. gauge.

Either company may use for line wires material other than copper, provided that the wires made of such material shall have a mechanical strength not less than that of the copper wires specified above; but no iron or steel line wires shall be used by the company occupying the upper position on the pole.

VI. *Climbing Space Through the Wires.*—An unobstructed way or climbing space shall be provided and maintained upon the poles so that the employes of either company shall be able to ascend every pole with reasonable safety and convenience up to and through the wires, connections, attachments and structures of the company occupying the lower position on the pole, and up to the wires and attachments of the company occupying the upper position on the pole.

VII. *Space Between Electric-light Pole Pins.*—In the case of poles where electric-light lines are carried below telephone lines or attachments a horizontal distance of not less than 16 inches shall be maintained between the pole center and the nearest electric-light line, thus providing a clear space of 32 inches in width for ascent of the pole through the electric-light lines.

VIII. *Space Between Telephone Pole Pins.*—Where telephone lines are carried below electric-light lines or attachments a horizontal distance of not less than 12 inches shall be maintained between the pole center and the nearest telephone line, thus providing a clear space of 24 inches in width for ascent of the pole through the telephone lines.

IX. *"Reverse Work," Sometimes Called "Buck-arm" or "T-arm" Construction.*—In the case of corner poles, or of junction poles, where additional cross-arms out of parallel with the normal cross-arms are required for changing the direction of the line or for branch lines, such construction is termed "reverse-work" construction.

Where reverse-work construction is employed by the company occupying a position on a pole underneath wires or attachments of the other company, the wires, attachments, connections and structures occupying the lower position shall be so located, constructed and maintained as to provide and keep open upon one side of the pole and next to the pole a vertical climbing space, the lateral dimensions of which shall include a square of not less than 30 inches on a side; it being understood that the pole itself may be included within the climbing space so measured.

X. *Aerial Telephone Cable or Insulated Telephone Wires on a Messenger Wire.*—Suspension or messenger wires carrying either aerial telephone cable or insulated telephone wires, may be carried on supports attached directly to the pole.

Where such messenger wire is above the electric-light lines, the messenger wire shall be placed upon the pole at a vertical distance of not less than four feet above the upper cross-arm occupied by the lighting company.

Where the messenger wire is below the electric-light lines, it shall be placed upon the pole at a vertical distance of not less than four feet below the lowest cross-arm occupied by the lighting company.

Where the messenger wire is below the electric-light lines and at a distance not exceeding six feet from the lowest cross-arm carrying those lines measured vertically to the messenger wire at the point of support, the telephone company shall place upon the pole immediately above the messenger wire and substantially parallel, but not in contact therewith, a standard wooden cross-arm not less than four feet in length, which shall be fastened at its center to the pole by the equivalent of at least two lag-bolts.

Where telephone wires or fixtures are below electric-light lines or attachments, in no case shall a messenger wire and its suspended cable or wire be so placed and maintained as to obstruct the climbing space provided for the employes of the lighting company through the telephone lines.

XI. *Lateral Connecting Wires to be Run on Cross-arms.*—The line cross-arms of both the electric-light and the telephone companies shall be attached upon the same side of the pole, the side of the pole occupied by these cross-arms being con-

1. A paper presented at the National Electric Light Association in Chicago on May 22, 1908. The author is inspector of electric plants for the United Gas Improvement Company of Philadelphia.

2. See Western Electrician of June 23, 1906, page 521.

sidered and termed the face of the pole, and the side opposite to the cross-arms being termed the back of the pole.

In the case of a pole which is double cross-armed so that it shall not evidently appear which is the normal face of the pole, one side of the pole shall be selected and designated by agreement and shall thereafter be treated as the face of the pole for the purpose of these specifications.

Connections to telephone lines or to telephone apparatus upon a pole may be run laterally across the pole, provided that when such telephone connections are below electric-light lines, connections or attachments, the telephone wires crossing the poles shall be run horizontally along a telephone cross-arm and attached either to the outer or to the under face of the cross-arm, so as to leave the back of the pole clear for climbing.

Connections to electric-light lines or to electric-light apparatus upon a pole may be run laterally across the pole, provided that where such electric-light connections are below telephone lines, connections or attachments, the electric-light wires crossing the pole shall be run horizontally along an electric-light cross-arm and carried on insulators on pins or brackets on the face of the cross-arm and at least six inches away from the pole, so as to leave the back of the pole clear for climbing.

XII. *Electric-light Wires or Cables Run Vertically Upon a Pole.*—Connections to electric-light lines for supplying service, or for street lamps, transformers, fuses, switches or lightning arresters, or connections to underground wires, and in general connections forming a part of the electric-light system may be run vertically upon a pole, and, if necessary, through telephone wires; provided such electric-light wires and connections are so constructed, placed and maintained as to conform to the following requirements:

Where such electric-light wires or connections are run through telephone lines, the connections from a point not less than 40 inches above to a point not less than 40 inches below the telephone lines shall be made with twin conductor wires or cable, each conductor being insulated with a standard rubber compound or its equivalent of the thickness as specified below, and each pair of wires being covered together by at least one thickness of weatherproofed, braided or woven covering.

If the twin-conductor cable carries a current of a potential of 300 volts or less, it may be carried on porcelain cleats screwed to the pole. If the twin-conductor cable carries a current of a potential exceeding 300 volts, it shall be either carried down the pole through a conduit of solid insulating material, the conduit being securely attached to the pole; or it shall be carried down the pole taut and fastened upon standard insulators, which shall be supported upon pins or brackets so constructed and applied that the cable shall be firmly held at a distance of not less than five inches from the surface of the pole.

The thickness of the rubber insulation to be used on the connecting wires herein provided for shall be determined as follows:

INSULATION FOR VOLTAGES NOT EXCEEDING 600

B. & S Gauge.	Thickness of Insulation
No. 8 or less.	3-64 inch
No. 7—No. 2.	4-64 inch
No. 1—No. 0000.	5-64 inch

FOR VOLTAGES EXCEEDING 600

Up to 500,000 c m.	6 64 inch

Where such electric-light wires or connections are run vertically upon a pole below telephone wires or attachments, but not at any point within a distance of 40 inches from the telephone wires or attachments, such electric-light wires must either be insulated and supported as above described, or must be carried on wooden insulators and pins upon a wooden cross-arm, and so placed and maintained that the electric-light wires shall not come within a distance of less than 20 inches from the center of the pole.

Lead-sheathed cable shall be enclosed within a pipe or conduit of solid insulating material wherever such cable shall be run upon the pole between a point not less than 40 inches above the highest telephone wire, connection or attachment, and a point not less than six feet below the lowest telephone wire, connection or attachment; excepting vertical telephone connections or wires which are protected and run in accordance with Article XIII.

Ground wire or wires throughout the entire length of attachment to the pole shall be enclosed within an insulating conduit or otherwise effectually insulated and protected.

All cables, wires, connections and conduits forming a part of the electric-light system and carried vertically upon a pole within the terms of this article shall be placed upon the semi-circumference of the pole on the cross-arm side or face of the pole, it being always further provided that poles jointly used and having such vertical attachments shall be furnished with pole-steps, and that no vertical attachments shall be so placed as to interfere with the use of the pole-steps. Where vertical attachments of the lighting company pass telephone cross-arms, they shall be run behind the telephone cross-arms, and not across the face of such arms.

XIII. *Telephone Wires or Cables Run Vertically Upon a Pole.*—Connection wires, service wires, ground wires or lead-sheathed cables forming a part of the telephone system may be run vertically upon a pole, provided they are constructed, placed and maintained in accordance with the following requirements:

The telephone-connection wire or service wire throughout its length of attachment upon the pole shall be insulated with a standard rubber compound, or its equivalent, and covered with at least one thickness of weatherproofed, braided or woven covering.

Lead-sheathed cable shall be enclosed within a pipe or conduit of solid insulating material wherever such cable shall be run upon the pole between a point not less than 40 inches above the highest electric-light wire, connection or attachment, and a point not less than six feet below the lowest electric-light wire, connection or attachment; excepting vertical electric-light connections or wires which are protected and run in accordance with Article XII.

Telephone ground wires throughout the entire length of attachment to the pole shall be enclosed within an insulating conduit or otherwise effectually insulated and protected.

All cables, wires, connections and conduits, forming a part of the telephone system and carried vertically upon a pole within the terms of this article, shall be placed upon the semi-circumference of the pole at the back of the pole away from the cross-arm side of the pole, it being always further provided that poles jointly used and having such vertical attachments shall be furnished with pole-steps, and that no vertical attachments shall be so placed as to interfere with the use of the pole-steps. Where vertical attachments of the telephone company pass electric-light cross-arms, they shall be run behind the electric-light cross-arms and not across the face of such arms.

[*To be concluded*]

LARGE FELT MILL ELECTRICALLY EQUIPPED

The Oscar Felt and Paper Company has closed a contract with the Westinghouse Electric and Manufacturing Company for nearly all of the electrical equipment of its large felt mill at White Pigeon, Mich. Current will be supplied by two 440-volt alternators, having respective capacities of 312 and 1,000 kilovolt-amperes. These machines are of the belted waterwheel type and are to be arranged to be driven either by waterpower or steam. The factory will be supplied with electric motors of a total capacity of about 1,300 horsepower, nearly all of the polyphase induction type, except on the paper machine, which has a 150-horsepower, variable-speed, direct-current motor operated through a motor-generator set. There are six sets of beaters. Each set is operated in pairs by silent-chain drive from a 175-horsepower induction motor placed between the two beaters of a set. Three jordans are each direct-connected to a 100-horsepower induction motor. In the paper machine the constant-speed end is driven by a 50-horsepower induction motor, and there are a number of smaller motors, ranging from 10 to 40 horsepower, used for miscellaneous purposes.

STREET LIGHTING IN LOGANSPORT

A new alternating-current, 60-cycle plant for street lighting is to be built by the city of Logansport, Ind., supplementing the existing municipal plant of older design. Three-phase, 60-cycle current at 2,300 volts will be generated by a Westinghouse 500-kilowatt steam-turbine alternator, and there will also be a 150-kilowatt alternator of the belted waterwheel type and a 30-kilowatt motor-driven exciter set. From a new switchboard 180 Westinghouse metallic flame street arc lamps will be controlled, together with the necessary equipment of transformers and rectifiers and a 50-light regulator. J. Walter Esterline of Lafayette, Ind., is the consulting engineer.

WITHOUT A PEER

A Central Illinois subscriber to the Western Electrician, writing on August 28, 1908, in relation to one issue which he failed to receive owing to some mischance in the mails, says: "I am having the paper bound in volumes, and I wouldn't miss a copy for anything. I consider it without a peer in the electrical field."

CONSERVATION OF POWER RESOURCES[1]

By H. St. Clair Putnam

Available Waterpowers.—Where power is derived from water, winds and tides, only energy otherwise wasted is used. The energy thus extracted is added to our assets instead of being a permanent loss, as is the case with the combustion of coal. It is now feasible and practicable to develop waterpowers, wherever located, for electric power. In the aggregate the available waterpowers of the nation greatly exceed the present power requirements, but unless there is some curtailment in the rate of our development our waterpower resources, while being of great magnitude, will not of themselves solve the problem of our future supply of power.

The amount of waterpower available in the United States is not known. Some partial estimates have been made, but these are necessarily approximate, as exact figures can be obtained only after careful survey and study, not only of the existing physical conditions, water flow and available reservoir capacity, but of the practicable auxiliary steam power that can be profitably installed. The power of Niagara has been estimated by Prof. W. C. Unwin at 7,000,000 horsepower. A partial estimate of the waterpowers of the upper Mississippi River and tributaries places the available waterpower at about 2,000,000 horsepower. The southern Appalachian regions can furnish a minimum of nearly 3,000,000 horsepower. Both of these estimates can be greatly increased by including the use of regulation reservoirs and auxiliary steam plants. The waterpowers of New England are more fully developed than elsewhere in the country, though much remains yet to be done. In the Rocky Mountains and the Far West there are immense waterpower possibilities; in the state of Washington alone there are 3,000,000 horsepower available, and Governor Pardee estimates that the streams of Northern California are capable of producing 5,000,000 horsepower.

Even approximate data upon which to base an estimate of the total amount of available waterpower in the country are lacking, though a good start toward collecting them has been made by the Geological Survey, with the limited means at its disposal. It is probable that the waterpower in the United States exceeds 30,000,000 horsepower, and under certain assumptions as to storage reservoirs this amount can be increased to 150,000,000 horsepower or possibly more. Much depends upon whether regulation reservoirs and reserve steam plants are included in the estimate. Both have been demonstrated to be practicable, and undoubtedly should be considered in any estimate made of the available waterpower resources of the country.

Using the smaller figure of 30,000,000 horsepower as an illustration to develop an equal amount of energy in our most modern steam-electric plants would require the burning of nearly 225,000,000 tons of coal per annum, and in the average steam engine plant, as now existing, more than 650,000,000 tons of coal, or 50 per cent. in excess of the total coal production of the country in 1906. At an average price of $3 per ton it would require the consumption of coal costing $2,000,000,000 to produce an equivalent power in steam plants of the present general type.

The supply of waterpower is limited, however, when the rapid rate of increase in our power requirements is considered, and great care, therefore, must be exercised to insure the preservation of our waterpower resources and to secure the maximum practicable development.

Total Power Used in United States.—Using the data furnished by the census returns of 1900, 1902 and 1905 as a basis and applying the prevailing rate of increase in the industries included in these reports, and adding an equivalent amount for the steam railroads, it is estimated that the total installed capacity of prime movers in all our land industries for the year 1908 approximates 30,000,000 horsepower.

The average load on steam and other engines is much less than their rated capacity, and owing to the overlapping of loads it is probable that the total average load does not exceed one-third or one-quarter of this amount.

Rate of Increase.—During the last 30 years the total amount of power used in our manufactories and other industries, as recorded by the census, has doubled approximately every 10 years. The fact that substantially the same rate of increase has existed in coal production, railroad gross earnings, freight ton-mileage, passenger mileage, and the value of agricultural products, as well as in total power consumption, is a striking demonstration of the close interrelation and mutual dependence of these great factors which, in the aggregate, measure the industrial progress of the nation.

Relative Use of Steam, Waterpower, etc.—Of the total estimated power at present produced by prime movers, about 26,000,000 horsepower is produced by steam engines, 3,000,000 horsepower by water motors and 800,000 horsepower by gas and oil en-

1. Portions of a paper presented at the Conference on the Conservation of Natural Resources at the White House, Washington, D. C., May 13-15, 1908.

gines. These figures emphasize the present position of the steam engine in our industrial development and the relatively much less important place now occupied by waterpower.

Growth of Electrically Applied Power.—Of the total 30,000,000 horsepower, including the railroads, used in the country, it is estimated that 9,000,000 horsepower, or 30 per cent., is now utilized electrically.[1] This highly remarkable growth has been accomplished in 25 years. The use of electric power at the present time is being doubled approximately every five years, as contrasted with the phenomenal doubling of the total power every 10 years. If the present rate of increase is maintained, electrically applied power will equal or exceed the power mechanically applied in 1920. This great growth is due to the convenience, earning capacity and economy resulting from the use of electrically applied power. The significance of this remarkable increase in the use of electric power in manufactures and other industries lies in the market thus provided for the utilization of our waterpowers wherever located and whatever their magnitude.

Fuel Economy of Gas Engines.—This discussion would be incomplete without mention of the great possible fuel economy that may result from the use of gas and other similar engines. Though engines of this character antedate the use of the electric motor, their development has been slow, and they occupy a relatively unimportant place as power producers. The ordinary steam engine utilizes not more than four or five per cent. of the heat energy in coal, and our best modern steam electric plants show a heat efficiency not exceeding 10 or 12 per cent. With the gas engine and producer gas, the heat efficiency can be more than doubled, and still higher efficiency seems probable with higher compression or through the use of other possible improvements. This is a most promising field for development, and it is entirely possible that the gas engine may revolutionize our methods of using fuel for the production of power.

Electric Lighting.—The extraordinary growth of the electric-lighting industry is familiar to all. Unfortunately the results of the special census of 1907 are not yet available, but the indications are that the five years which have elapsed since the previous census will show phenomenal growth. During these five years the gross sales of the great electric manufacturing companies have doubled, and the proportion of the output consisting of electric power apparatus and generating units of large size has greatly increased. An influential factor in the growth during this period has been the rapid development of long-distance hydro-electric power-transmission plants.

Electric Railways.—Since the displacement of horse and cable cars in the cities a few years ago, electric railways have been extended to suburban and interurban districts and are rapidly forming a network over the entire thickly settled portions of the country. In the nature of their traffic, many of these roads are scarcely distinguishable from steam railroads, and many railroads are using them as feeders. In a few cases railroads have converted steam operated branches into electric lines.

Electrification of Steam Railroads.—A beginning is being made in the electrification of our steam railroads. The New York Central, the Pennsylvania, the Long Island, the New York, New Haven and Hartford, the Grand Trunk, the Great Northern, the Erie, the Southern Pacific and others have electrified portions of their lines, and most of these are now in successful operation. Many of these roads are extending their electric zones.

Regulation of Stream Flow.—The flow of water in many streams annually fluctuates between wide limits. The low-water periods limit the profitable waterpower development and the high periods often cause disastrous floods. On most streams the average rate of flow for the year is many times the minimum flow. It is possible in some cases to utilize a flow approximating the average by constructing controlling reservoirs on the headwaters of the stream. Our Great Lakes form a natural reservoir of this character for the Niagara River. The Upper Mississippi has great natural reservoirs which assist in regulating its flow and which easily can be made very effective in its control. The notable floods of the Ohio River can be greatly reduced by the construction of controlling reservoirs on its headwaters which will result in the saving of millions of dollars now annually destroyed. On a stream which I recently investigated the minimum flow furnishes but 200 horsepower. The construction of a storage reservoir increases the continuous 24-hour power that can be utilized to 8,000 horsepower. If storage reservoirs could be constructed on the Susquehanna River, upon which a great waterpower development is now in course of construction, so as to obtain a uniform flow throughout the year, the available power at this site would be increased from a minimum of 30,000 horsepower to 200,000 horsepower. While it is impracticable to construct reservoirs capable of holding back all flood waters, it is nevertheless certain that material gain would result from well-directed efforts along the lines suggested.

Auxiliary Steam Plants.—On account of the great annual fluctuations now existing in stream flow, it has been found profitable to install steam plants supplementing the waterpower during seasons of low water. This method on account of its expense greatly handicaps the full development of our waterpowers and increases the amount that must be charged for the power. Under given conditions the most profitable amount of waterpower to develop and the best size of steam plant to install can be determined with great accuracy. The reserve steam station need not be located at the waterpower; in fact, it preferably should be located at or near the market for the power when that is distant, as greater reliability and continuity of power supply is thus secured. Headwater regulation would greatly reduce the necessity for such auxiliary steam plants.

Similarly the waterpower which can be purchased economically by a prospective customer who already has a steam plant in operation can be accurately determined. This amount depends upon the relative cost of generating different portions of the load by steam as compared with the amount charged for the waterpower supplied. In its economical application this method of operation works out so that the waterpower plant carries the steady portion of the load where the coal consumption per horsepower capacity is greatest, and the steam plant is called upon to carry the peaks only where the coal consumption per horsepower is least.

Interconnected Plants.—In addition to their reserve function in time of low water or flood, auxiliary steam plants and interconnected plants are valuable as insuring the continuity of power supply. If the lines are run overhead, as they must be for long-distance transmission in the present development of the art, all electric transmission plants are subject to occasional short interruptions due to storm, lightning or malicious mischief. It is economical and desirable to tie together two or more plants, thus greatly increasing the reliability of service. If one plant or transmission line fails the others can be pushed to take the load. From an engineering standpoint and from the standpoint of the customer, as well as the power producer, this method of operation has great advantages.

Importance of Power Resources.—In 1905 the value of the product of our manufactures amounted to $16,866,706,985; the total receipts of the steam railroads were $2,325,765,167.

In manufacturing the value of the product was $1,152 for each horsepower installed and the yearly wages amounted to $248 per horsepower.

In the railroad industry the gross receipts amounted to $555 and the yearly wages to $224 per horsepower, rated on a basis comparable to that used in the census report covering manufactures.

I have selected these two classes of industry for the reason that they use the bulk of the power and illustrate its tremendous productiveness in increasing our wealth.

On the basis of the lower estimate of waterpower already mentioned, namely, 30,000,000 horsepower, and applying the ratio which now exists between wages paid and power utilized in manufacturing and railroad industries, the development of this amount of waterpower implies an increase in wages paid amounting to about $15,000,000,000 per annum, an amount more than double the total value of our agricultural products at the present time.

Collection of Data Necessary.—These figures emphasize the vast financial importance of our power resources and the necessity of their conservation and their intelligent development. Much can be accomplished by the national government in connection with irrigation of national lands and the improvement and preservation of navigable waters. The state governments can greatly assist in this work within their respective territories.

Census of Water Resources.—A reliable census of water resources is greatly needed. The Geological Survey has accomplished much in measuring and recording the flow of streams, but the work done is small as compared with that which remains to be done. Obviously, in order that records of this character shall constitute a uniform and safe basis for the very large capital investment which must be made in the future in order that our waterpower resources shall be properly utilized and our fuel supplies conserved, they should be made under the immediate direction of the national government.

Research Work.—The national government can render great assistance also in the research work which it has undertaken into the better utilization of our fuels. Excellent results have been obtained by the able body of engineers engaged on this work, but when we consider that we are now utilizing but 5 or 10 per cent. of the heat value in fuels it is evident that much remains to be done.

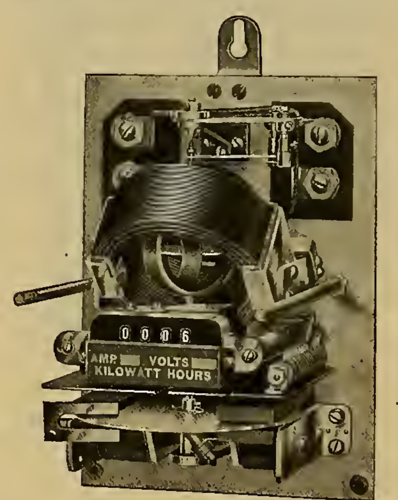
Necessity of Government Regulation.—Power and transportation are the two great physical bases upon which modern industrial development rests. Without power our methods of transportation must revert to a level with those existing in China. Up to the present time while nation and states have regulated and in some degree aided in the development in transportation, the power resources of the country have been utilized or wasted by the private individual and the corporation with little hindrance and still less regulation by the constituted authorities. Next to individual enterprise the most essential factor in the development of our national resources is wise governmental guidance, so applied as to insure the vigorous working of individual initiative and at the same time prevent the waste by individuals of that which is vital to our national welfare and to secure in the utilization of our natural resources the highest practicable degree of economy which scientific knowledge and engineering skill can attain.

1. This does not include the electric power generated in isolated plants and used for other purposes than manufacturing. These plants are not included in the census reports, and while they are individually small the aggregate electric power developed is large.

COLUMBIA METERS

The accompanying reproduction shows the construction—cover removed—of a well-built watt-hour meter presenting the advantages of medium torque and price and suitable for hard and long practical use. The Columbia meter is asserted by its manufacturers to stay as accurate and reliable as the more complicated and expensive high-torque meters.

This meter has some features which are new to the American meter customer and which the makers believe are a distinct advance in meter construction. The armature is of the open-coil type having three coils of the same size and shape, symmetrically arranged and connected to a three-part commutator. An advantage of the open-coil armature is the use of form-wound coils which may be thoroughly insulated. The reduced number of commutator lead-wires decreases the possibility of breakdown of the fine wire.



COLUMBIA METER

The shunt resistance is a small spool on one side of the meter, open to easy inspection and testing, and may be replaced by a new resistance in a few seconds. The shunt loss is about two watts at 100 volts. The damping magnets are not moved in calibrating, but a light and easily adjustable armature regulates the damping by shunting more or less of the magnetic flux around the disk.

The Columbia meter is over-compensated by the compounding coil and made to run fast on low load. If an accuracy of say 3 per cent. is desired on 50 watts, the meter is adjusted 3 per cent. fast; this then gives the necessary accuracy as desired; but when in service, as the friction increases by long continued use, the meter will correct itself to a certain extent and show a better agreement between the constants of low and high loads.

The adjustment is made by an iron screw which is magnetized by contact with one of the damping magnets.

The meter is provided with a cyclometer counting register, with jumping figures, reading direct in kilowatt-hours. This movement is of a novel construction and, it is believed, will run as light as a dial movement. The Columbia meter illustrated herewith is known as type A, form C, and is the product of the Columbia Meter Company, Indianapolis, Ind.

It is stated that an American company has a project on foot to purchase the mule-tramway lines and other public-service properties at Orizaba, Mexico, for the sum of $625,000, gold, with the intention to change them to electric traction. Waterpower is abundant in that vicinity.

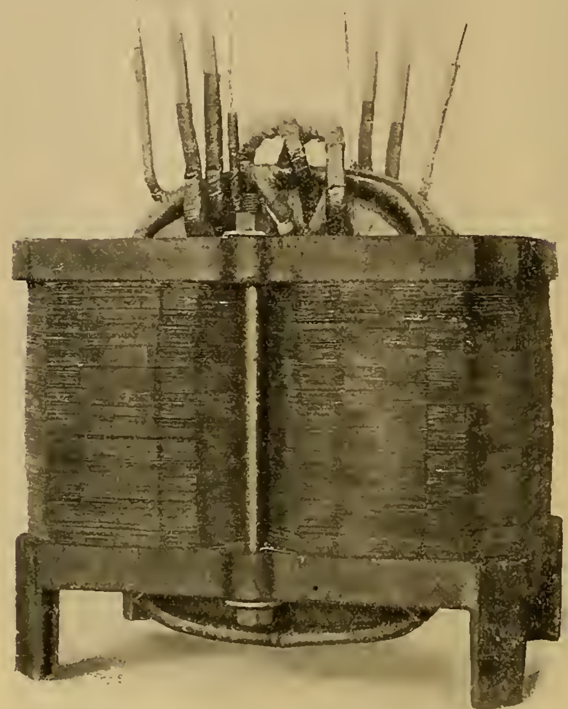
CHARACTERISTICS OF CENTRAL-STATION TRANSFORMERS

The manufacture of transformers of 50 kilowatts and less, known among central-station men as "lighting" or central-station transformers in contradistinction to the so-called "power" or "transmission" transformers, of sizes above 50 kilowatts, presents certain special problems which are only to be solved by manufacturers having years of experience in the design and construction of apparatus of this character.

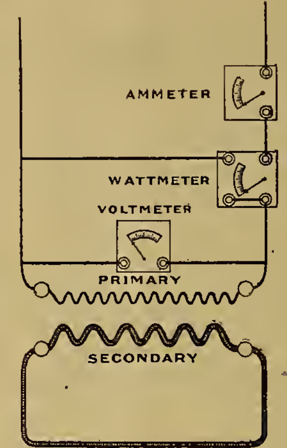
These problems are entirely apart from the question of type, whether "core type" or "shell type," which may be a matter of individual preference or precedent on the part of the transformer builder.

The experienced builder of central-station transformers must, first and foremost, understand the conditions that confront the operating companies. One of the most important of these conditions is the compulsion that the companies are under to meet their service requirements with minimum investment in transformers. This condition does not mean the selection of transformers on a criterion

CENTRAL-STATION TRANSFORMER COMPLETE



CENTRAL-STATION TRANSFORMER WITH CASE REMOVED



CONNECTIONS FOR IMPEDANCE TEST OF TRANSFORMER

of low first cost; on the contrary, it means that the careful buyer, in making his yearly contracts or individual purchases, will give greater weight to efficiency, reliability and life than to saving in first cost of installation. The foolishness of being blinded by the latter consideration to the exclusion of other and more vital ones, has often been exemplified in the disappointment and loss occasioned by buying transformers of incorrect design or materials, or both. Such apparatus is bound to fall short in the important features of core and copper losses, insulation, cooling and general ruggedness in service, in all of which the user is vitally interested.

Another condition is the necessity of good regulation, which is recognized as essential to satisfactory lighting service and which is no less essential to the satisfactory load performance of motors. The importance of good regulation in the latter service may be clearly shown. The prevailing types of alternating-current motors all operate on a power factor varying from 50 to 90 per cent., depending on the percentage of load carried. On the other hand, it is well known that the load capacity of any alternating-current motor drops with the square of the fall of pressure supplied to the motor terminals. For example, a 10-horsepower motor at a pressure of 110 volts will have a capacity of only 8¼ horsepower if served 100 volts. Since a drop of 10 volts may easily occur in the transformer if the latter be of poor design with respect to regulation, the importance of the wise selection of transformers to meet such conditions is obvious.

Intimately connected with the preceding is a third condition, viz., the way in which transformers of poor regulation menace the service of the central-station company by shirking their load. Thus, if transformers of poor regulation are connected in parallel with transformers of good regulation, as the load increases the former will, by falling off in voltage, shift a good part of their share of the load to the latter, which will thereby be overloaded and may even be burned out.

The Wagner Electric Manufacturing Company of St. Louis, Mo., has specialized in the manufacture of transformers since 1891. Its experience and its recognition of the needs of the central-station companies as above outlined have resulted in a line of central-station transformers having the following desirable operating characteristics and features of design and construction:

In the first place, the practice of this company is to employ in its central-station transformers substantially the same features of electrical and mechanical design as are employed in power transformers, with the object of attaining thorough reliability in service, long life and the maximum efficiency consistent therewith. In the accompanying view of the transformer element with case removed, it will be seen that the transformer is of the shell type, which is employed by all manufacturers of high-tension and large transformers.

The use of the new so-called "alloy steel," which the Wagner company claims to have been the first transformer manufacturer to employ in the United States, has resulted in marked advantages. Transformer cores built of this steel show not only marked reduction of initial core losses and therefore corresponding increase in all-day efficiency, but also freedom from "aging" and its consequent lowering of efficiency from heating of the transformer in operation, which is a weak point of the ordinary sheet steel formerly used in such apparatus. Previous to the use of this new steel the operation of transformers was wisely restricted to the temperature limits prescribed by the American Institute of Electrical Engineers, for the reason that the sheet steel then employed in transformer construction aged rapidly if heated much above those limits. In the present transformers the criterion of heating is not under this restriction, but is the safe operating temperature of the insulating materials employed, although it has not been deemed wise by the company to modify the standard temperature limits that have hitherto obtained.

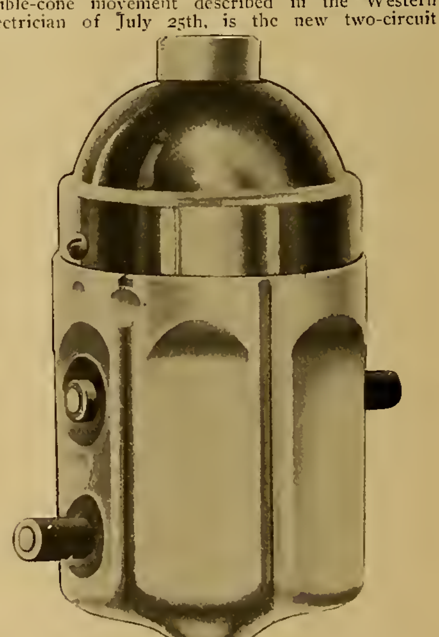
Unusually effective oil cooling and insulation is another salient feature of these transformers. The secret of success in properly cooling a small transformer consists in affording the oil ample opportunity to reach all the active materials. That this result is not only possible but is actually accomplished in Wagner transformers is due to the peculiarly effective method of spacing all the parts. It will be noted that there are no wide individual coils in these transformers, but that the coils are so subdivided as to make the interlacing layers comparatively narrow. This spacing not only permits free circulation of the oil and the maintenance of all parts at a uniform temperature, but it also reduces to the smallest working limits the pressure between the layers, thereby practically eliminating the liability of puncture between them.

Wagner transformers do not depend upon the oil for internal insulation. All of the customary guarantee insulation tests are made upon the transformers and sustained successfully by them before adding the oil. The insulation of these transformers is therefore exceptionally good, since the effective dielectric strength of the oil is added on to the already high insulation of the transformer structure. Moreover, in the construction of the transformer no insulating compounds are used that can be affected by the oil.

As indicated above, regulation is an especially important feature of a good central-station transformer. The attaining of excellent regulation has been made a matter of first consideration in the design and construction of the Wagner central-station transformers, which are designed with a view to their employment on either lighting or small-motor service. An approximate rule for determining whether two transformers of the same size but different makes will operate satisfactorily in parallel is to compare them on what has been termed the "impedance test" applied to each of the transformers in turn. As shown in the accompanying diagram, this test consists in short-circuiting the secondary and applying an alternating current of low voltage—not exceeding two to five per cent. of the normal operating voltage—to the primary, adjusting the value of this voltage until full-load current flows through the latter. A wattmeter inserted in the circuit will then indicate roughly the actual full-load copper loss of the transformer under service conditions. If the wattmeter and voltmeter readings are about the same for the two transformers, they will operate fairly well in parallel.

NEW TWO-CIRCUIT PENDENT SWITCH

A useful addition to the line of Cutler-Hammer push-button switches utilizing the rolling-spring, double-cone movement described in the Western Electrician of July 25th, is the new two-circuit



TWO-CIRCUIT PUSH-BUTTON PENDENT SWITCH

pendant illustrated herewith. It contains two of the same simple contact mechanisms as the other pendent switches and may be used to control two separate light circuits in a cluster, or any other two circuits as needed. The body of the switch is of porcelain, and the brass cap is provided with a porcelain bushing. A complete line of push-button switches in sockets, pendants, wall switches, etc., was recently brought out by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

TRANSFORMERS FOR MANHOLES

Herewith illustrated are transformers supplied by the Westinghouse Electric and Manufacturing Company to one of the largest electrical companies in the country employing underground distribution. The advantages of this type of construction have led to its adoption for the entire line of transformers designed for manhole service. These transformers are installed in subway manholes which are liable to flooding, and, in addition, these underground chambers are rarely well ventilated. For this reason it is necessary to enclose the transformer in a hermetically sealed case, and design it for an exceedingly low-temperature rise. The transformers are of the oil-insulated type, and a large air space is left at the top of the case to take care of any expansion of the oil under a rising temperature. Necessarily, this compresses the air in the upper portion of the case and causes a slight rise in pressure. Under abnormal operating conditions, such as a short-circuit, a considerable rise in this pressure may occur, and the transformer case may be seriously injured. In order to avoid any danger from such occurrences a horn-shaped brass casting, as shown in Fig. 1, is used for the oil plug in the cover. The mouth of the horn is closed by a thin sheet of copper which will rupture, acting as a safety or relief valve, for any excess pressures. Each case is tested with an air pressure of about 10 pounds per square inch and carefully inspected for leakage before shipment.

An improved bushing is used for the leads of these manhole transformers which permits connection or disconnection from the line without removing the cover or otherwise opening the transformer case. This design of bushing (Fig. 2) eliminates any necessity for breaking the joints of the transformer case and eliminates the danger of water leaking into the transformer through a joint made under difficulties in the confined space available in a manhole. A further advantage is that this joint permits transformers of the next larger or smaller size to be substituted in any manhole. Three sizes of bushings cover the full line. The joint is made without any solder except that in the plumber's wiped joint required to connect the lead covering of the cable to the brass sleeve. This is a permanent connection and made when the first transformer is installed. A number of transformers of this design have been arranged to operate on a three-wire, low-tension circuit with a grounded neutral. When this method of operation is used, the neutral tap on the low-tension side of the transformer is grounded directly on the transformer case, through a stud terminal, as shown on the right-hand view in Fig. 1. The high-tension side of the single-phase transformer, as shown on the left of this figure, is only provided with two outlet bushings.

FIG. 1. TRANSFORMERS FOR MANHOLES

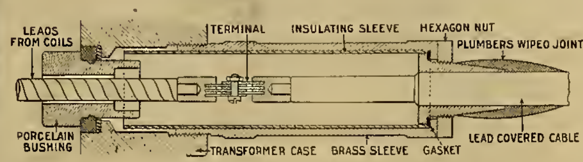


FIG. 2. BUSHING FOR TRANSFORMER LEADS

By the opening on September 15th of an eight-mile electric railway from Mount Joy to Elizabethtown, Pa., the through line from Lancaster to Harrisburg is almost completed. Only a stretch of five miles from Elizabethtown to Middletown remains to be built.

ON THE BACK OF A BUSINESS CARD

Co-operation and good will between company and customer are very large elements in the success of a central-station business. In Dayton, Ohio, this principle is clearly recognized, as is shown by this declaration on the back of the business card carried by all representatives of the Dayton Lighting Company:

"The representative will be pleased, first, to locate and remedy any incomplete or unsatisfactory service; second, to give our consumers any and all information required to make our service perfectly satisfactory; third, to acquaint consumers with new and useful appliances which may benefit their service and lessen their cost; fourth, to adjust any grievance and secure friendly relationship between the company and the consumer."

ALPINE TELEPHONE STATION AT 15,000 FEET

Italy is soon to possess the highest telephone station in Europe. The telephone will be installed at the highest peak of Mont Rose, which is the second highest point of the Alps after Mont Blanc. This peak is known as the Pointe Dufour, and is already provided with a refuge cabin which is well known to Alpinists. It extends to an altitude of 4,651 meters. The proposed telephone line is to be run to this refuge and it will render great service to mountain climbers who may be surprised by storms, as they can thus telephone for help. The line will run to a second cabin on the mountain and also to the observatory, which has been lately placed at the Olen Pass.

A POSSIBLE CENTRAL-STATION MISTAKE

There is one mistake in flat-rate lighting and long-hour meter business that is very easy to make, and that is of selling the customer more light than he can afford to pay for. It is true that it is his business how much he spends for light, but it is your business not just to get in the original installation and two or three months' bill, but to get a permanent, satisfied customer.—Fred Leslie of Muncie, Ind., in paper read before Ohio Electric Light Association.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE.

Paris, August 25.—The rates for telephone messages between Paris and London are to be reduced to one-half the former rate, according to an agreement which was made some time ago between the two administrations to this effect. The present rates are $2 for a three-minute conversation. In order to carry out this measure it will be necessary to double the number of cables. The four cables which are laid at present will be insufficient to meet the demands, for the number of conversations which are now exchanged between Paris and London averages 240 a day, and it is expected that when the new rates go into effect that this will result in a considerable increase in the use of the lines. Accordingly, there will be laid four new cables, and these are now in construction. Two of them are being manufactured in France and two in England. As soon as the cables are laid, the reduction in rates will take place.

Experiments have been carried out quite recently with wireless telephone apparatus at the Eiffel Tower, and it was possible on the 5th of August to transmit conversation as far as Dieppe, over a distance of 90 miles. This result is secured by the military wireless corps, using apparatus of the Poulsen type. At the same time the engineers are at work on a new wireless-telephone apparatus which is expected to give good results.

It has been found that high-tension power lines have a certain action upon hailstorms, according to a note upon the subject which was presented by the well-known electrician, Mr. Violle, at a recent meeting of the Academy of Sciences. A severe hailstorm took place in France not long since on a stretch of territory 1.2 miles wide and from eight to nine miles long. It followed exactly the direction of a power line in the region which is operated at 45,000 volts. While it is not certain that such power lines will attract hailstorms, it seems that at least they have a certain action in directing them.

Wireless messages were received from the ground by a balloon in the course of experiments which were carried out near Paris. The balloon, mounted by Count de la Baume-Pluvinel, was kept at about 1,500 feet from the ground. Signals were exchanged with different posts on the ground with success. The balloon also took the messages which were passing between the Eiffel Tower and Casablanca (Morocco), while sailing under a moderate wind.

It is reported that the Brown-Boveri Company of Switzerland is engaged in constructing a new type of three-phase locomotive for standard-gauge railroads. It differs from the former locomotives which this company built in many respects, especially from the fact that four speeds are now used instead of three. This number of speeds has been difficult to obtain hitherto. The motors are of the induction, squirrel-cage type instead of the usual form with collector rings.

There is considerable trouble at present in Paris in the underground work on the Metropolitan Subway lines on account of strikes, and many of the principal working points are guarded by soldiers and policemen. The construction work will be retarded considerably on this account. A. DE C.

GREAT BRITAIN

London, August 27.—A curious tramway accident took place in Liverpool a few days ago, and, fortunately, only a few passengers were injured. The driver of a car, when descending a hill, found the electric brake incapable of holding it in check and applied the hand-brake in addition. The pawl, however, failed to lock itself in the ratchet wheel and the handle of the brake flew back and hit the driver on the arm with considerable force. Before he recovered himself the car had attained a fair speed, and, in addition to running onto a curve, a lorry crossed the rails at this moment. The result was that the car struck the lorry and the combination of collision and curve was that the car left the rails. This accident, of course, will be the subject of an inquiry by the Board of Trade, a department which is being provided with a good deal of work just now in connection with tramway matters.

It is reported that Mr. C. H. Merz of Newcastle-on-Tyne will shortly present his report upon the electrification of the Victorian (Australia) Railways. Mr. Merz was commissioned to take this matter in hand in a consulting capacity some time ago, and paid a special visit to Australia for the purpose. When tenders are called for eventually, some very large contracts should be given out.

The program of the engineering section of the British Association meeting in Dublin next week includes little of electrical interest. Recent advances in steam turbines will be discussed by a member of Messrs. Parsons' firm, and several papers on gas engines will be presented. Trolley omnibuses, which are attracting quite a lot of attention here just now, will also be the subject of a paper.

Some time ago the Royal Meteorological Society arranged for weather reports by wireless telegraphy to be sent from battleships of the British navy, and the annual report of the society records appreciation of the 150 messages received last year, as they afforded a valuable addition to the information received from the land stations and considerably assisted in forecasting storms. The sending of similar messages by merchant vessels has also received consideration, and an estimate of the cost has been prepared. It is computed that $5,000 per annum would be necessary in order to secure a really practical and serviceable working arrangement with the mercantile marine.

Promoters of exhibitions for the year 1908 would seem to be insatiable in their desire to stimulate public interest. Following on the large number already announced, most of which have some direct connection with electricity, we are promised an ideal home exhibition, one of the features of which will be the use of electricity in the home, and an India rubber exhibition. In connection with the latter, the editor of the India Rubber World of New York will lecture in London.

The company running the very successful service of electric omnibuses in London is extending its ramifications into the provinces where tramways have not made their appearance. At Hove, on the south coast, where a very noisy petrol bus service is now run, some electric buses have been delivered. At York and Oxford, where the corporations are seriously entangled with the tramway question, owing to considerable differences of opinion, the electric omnibus company has made application for licenses to run its vehicles, and now at Aberdeen, where the trolley omnibus seems to be regarded with favor, a similar application has been put before the Town Council. G.

NEW ENGLAND

Boston, September 5.—The Edison Electric Illuminating Company of Boston is soon to issue 9,725 shares of stock at $215 per share. The number of shares outstanding is 126,436 at the present time. In anticipation of this the price of shares quoted in the stock market has advanced from $215 to $250 in the past few days. Just after the panic the stock sold as low as $185, which was the lowest quotation in 10 years. The highest was $302 in 1903. The new issue will provide for the floating debt created by expenditures for new construction and extension of the business. The company this week purchased an estate on Salem Street, assessed for $45,000. Its plans for the use of the property are not as yet made public, but it is probable that it will be for an auxiliary station.

It is understood that the inventory of the property of the New England Telephone and Telegraph Company, ordered by the Massachusetts Highway Commission when it was given by law supervision over the telephone and telegraph business in this state, has been practically completed by the commission's expert, Prof. D. C. Jackson, as far as the examination of equipment, etc., is concerned. It now remains to complete the work of tabulation and draw deductions, and the report thereon is expected in November. It is believed that revision of rates will be recommended, although no definite information to warrant this is obtainable, of course, at the present stage of the inventory. The American Telephone and Telegraph Company now holds upward of 208,000 shares of the New England company's stock, so that an advance in the dividend rate from six to seven per cent., as is said to be in prospect, would benefit the parent company by the amount of $200,000 and more per annum.

The Boston Elevated Railway Company's earnings for August show a decrease compared with those of August a year ago, although not so large as the July decrease was. Gross earnings for the month were $1,133,000, against $1,170,000 in August, 1907. The cities of Everett and Malden this week disapproved the plans of the Boston Elevated for an overhead structure through the two cities to Malden Square. It is probable that conferences will be held with a view to bringing about changes in the plans on a compromise basis.

The lock in the new Charles River dam now under construction between Boston and Cambridge, which is opened and closed by electrically operated gates, was given its first official test September 1st, and was found to work perfectly.

The new electric railway from Waterbury, Conn., to Woodbury, Conn., was opened September 1st. The latter place is a modern town of about 2,000 inhabitants, but has never before had rail facilities, steam or electric. Curiously, the charter under which the road has just been built was granted 16 years ago. It is controlled by the New Haven Railroad Company.

A bondholders' protective committee will investigate the affairs of the Hudson River Electric Power Company. The bonds are held largely by New England capitalists and investors, and the members of the committee are James R. Hooper, chairman, who is the actuary of the New England Trust Company; Gordon Abbott, president of the Old Colony Trust Company; Edwin S. Webster, of Stone & Webster; Horace E. Andrews, of the Mohawk Valley Company; John P. Reynolds, Jr.; John S. Scully.

The Boston Elevated Railway Company will soon find it necessary to finance its Cambridge subway from the Charles River to Harvard Square. The plans have been practically agreed upon by the Railroad Commission, the city of Cambridge and the railway company, and an issue of $8,000,000 of new stock is contemplated. This subway, unlike those in Boston, which are owned by the city and operated under lease, will be built and owned by the railway company.

The Bar Harbor and Union River Power Company has now completed its line from the big power plant in Ellsworth to Bar Harbor, Me., a distance of about 23 miles, for the transmission of light and power. This is an ambitious project for supplying electricity to Maine cities and towns throughout a territory of wide radius, and the line is now being continued to Bangor. The capital is $1,000,000, of which $850,000 has been issued. B.

NEW YORK

New York City, September 5.—The Public Service Commission has dismissed the complaint of John H. O'Brien, commissioner of water supply, gas and electricity, against the New York Central Railroad for maintaining an overhead high-tension system of electrical transmission within the city limits. The commissioners leave it for the courts to decide whether the assertion of O'Brien that the New York Central put up the wires in direct violation of the permit granted by the city is well founded. O'Brien asked the Public Service Commission to compel the railroad company to take the supply cables off the poles in Harlem and The Bronx and to put them underground. It would have cost the railroad company from $1,500,000 to $2,000,000 to carry out such an order, and since the proceeding was begun before the commission the railroad has set up a spirited resistance to such an order. The complaint of the municipal commissioner was filed last March. At the hearings it was admitted that the New York Central's aerial construction is as safe as it can possibly be made, but Mr. O'Brien's engineers contended that an underground transmission would be more free from risk. Commissioner Eustis argues that it would be unreasonable for the Public Service Commission to order the New York Central to destroy its present lines and place its high-tension wires underground at such a great cost.

Plans have not been abandoned for a terminal of the Hudson and Manhattan "tube" company at Sixth Avenue and Thirty-third Street. It had been reported the company intended to run its subway trains into the Pennsylvania terminal in Ninth Avenue, between Thirty-first and Thirty-third streets, but the engineers say a plan for the McAdoo station will be adopted in a few days. Many plans had been rejected because certain difficult engineering problems had not been overcome.

From the report of the Brooklyn Rapid Transit Company just made public the company, which carries 1,500,000 passengers daily, may be required to cut its transfer privileges. According to President Winter's statement for the fiscal year ended June 30th last, the average gross earnings for each passenger were 3.67 cents, while the cost of carrying each passenger was 2.25 cents, leaving a net earning on each nickel of 1.42 cents. From this, he says, must be deducted all charges other than for the operation of the roads.

Reports from Oyster Bay announce that the President has accepted the plans for the two new battleships, the Florida and the Utah, which are sister ships to the North Dakota and Delaware, but will be equipped with steam turbines instead of the reciprocating engines used on the older boats. Either the Curtis or the Parsons types of turbines will probably drive the new vessels.

In the Mardi Gras parade to be held at Coney Island September 14th the twelve handsome floats will be illuminated by electric lights. In past seasons a few of the floats have been so lighted, but as the lamp current was derived from storage batteries, the effect was not as brilliant as had been hoped. This time trolleys on the front and rear floats will make contact with overhead wires strung along the line of march, and an elaborate lighting scheme will be made possible. The floats will depict allegories of progress in science and art. W.

SOUTHEASTERN STATES

Charlotte, N. C., September 5.—Work on the Atlanta end of the 200-mile electric line to Augusta is to begin this month. Stations along the route of the Atlanta and Carolina Railway will include Lithonia, Conyers, Athens, Munroe, Washington, on to Augusta. It is proposed to complete the line in 18 months. A four-hour schedule between the two cities will be put in effect when the road begins operations.

E. B. Cline and C. A. Somers of Philadelphia and others are visiting the towns in the vicinity of Horseford Shoals, on the Catawba River, near Hickory, N. C., seeking subscriptions to the capital stock of the electric power company, and also contracts for power. At a recent visit to Lenoir, N. C., the prospects of securing a $25,000 subscription from the town were found excellent.

The Allis-Chalmers Company and the Fort Wayne Electric Company have been awarded contracts for improving the electric-lighting plant of the town of Barnesville, Ga., the expenditures representing about $7,000.

Upon application of the Asheville Electric Company and other creditors, Judge Ward of the Superior Court has placed the Asheville (N. C.) Rapid Transit Company in the charge of J. P. Arthur as receiver.

A franchise has been granted E. S. Pulley to build an electric line in Huntsville, Ala., and laborers are now being sought in order to begin active construction work by September 19th.

It is estimated that 35,000 horsepower of electrical energy will be ready for distribution from the electrical development at Blewitts Falls, near Rockingham, N. C., within nine months.

The electrical development on New River, in Ashe County, N. C., and at Greyson, Va., just over the state line, by the F. H. Fries Company, with $2,250,000 capital, is declared to be one of the most modern in Western North Carolina. A 50,000-spindle mill, with 1,500 looms, is operated at Fries, in Greyson County, and it is rumored that this mill will be doubled in capacity soon. With a 40-foot dam, 7,000 horsepower is available, although only 2,500 horsepower is used at present. Below Fries is an undeveloped 50,000-horsepower fall, the property of Dr. G. W. Kernoodle of Greensboro, N. C. With 25,000 undeveloped horsepower at and near Greyson, Sulphur Springs, it is predicted that the New River for miles above and below Fries will some time present an almost uninterrupted scene of industrial activity.

The Salisbury-Spencer (N. C.) electric railway on August 29th began the regular use of power supplied by the Southern Power Company from a plant 50 miles distant. Within a short time all electric power used in the towns of Salisbury, China Grove and Spencer will be obtained from the power company.

The Western Electric Company in a competitive bid has been awarded a $65,000 contract for electrical machinery to be installed at the Loray Cotton Mills, at Gastonia, N. C. The contract was awarded by engineers of the Southern Power Company of Charlotte, which will furnish the electric power to be used in operating the mills. About 3,000 horsepower will be required.

The Greenville Light and Water Power Company is preparing to expend $100,000 in the development of a waterpower on the Meherrin River, near Emporia, Va. A survey of the waterpower one mile from Emporia indicates that, with the erection of a 36-foot dam, there will be 1,400 horsepower available for power purposes.

The recent floods in North and South Carolina caused great uneasiness among the owners of power plants along the various rivers flowing down from the Appalachian range of mountains, as this was the first severe test to which most of these recently erected plants have ever been subjected. The construction work of the dams, water-races, etc., however, proved able to stand the great strain to which it was subjected, and there were no serious breaks or injuries to dams or machinery reported. The various plants of the Southern Power Company along the Catawba River were unharmed, although the rise in the river in places exceeded the high-water record on this stream. The power houses of plants on other streams were flooded, however, including those of the Enoree Power Company, near Spartanburg, S. C.; the plant at Portman Shoals, near Anderson, S. C., and the Savannah River Power Company's plant at Gregg Shoals. The results of the enormous strains on the concrete and masonry work, lasting in most cases for periods of 36 to 72 hours, will be of value as illustrating the stability of the construction work. L.

OHIO

Toledo, September 5.—Local electricians and electrical supply houses have been kept busy as a result of the national encampment of the G. A. R., which is being held in Toledo this week. The demand for electrical equipment was never greater, and many signs and displays and hundreds of additional lights of all kinds and descriptions were installed. The city is one blaze of brilliant electrical display, much of which will remain permanently.

Once again a petition has been presented to the Council of Lima protesting against the proposed new municipal lighting plant, and was like all its predecessors, turned down. It was signed by about 1,000 taxpayers who do not believe in the advisability of municipal ownership. At a special session held for the purpose, the Council adopted the recommendation of Mayor Becker that a competent engineer be employed to draw plans for a city plant and that bids be opened but no contract made until the exact cost can be ascertained.

It is said that the Lake Shore Electric Railway will remove its offices from Findlay to Sandusky about the first of October. A lease has been secured on the Moore Building at Sandusky, and the local station there will be removed to the first floor of the building, while the offices of the company will occupy the second and third stories. H. L. S.

INDIANA

Indianapolis, September 5.—The Evansville and Eastern Railway Company has been incorporated with a capital of $10,000. The company will construct and operate street-railway and interurban lines in southern Indiana, and furnish electric light to the towns and cities. The incorporators are headed by John C. Lake of Evansville.

The Logansport, Frankfort and Indianapolis Traction Company, capitalized at $25,000, has been incorporated to construct an interurban road between Logansport and Frankfort, connecting a number of intervening towns. Among the directors are Samuel Blakeslee of Cleveland, Ohio, W. P. Clark of Kent, Ohio, and others.

Interest has been revived in a proposed interurban line from Anderson to Lebanon, via Noblesville.

Wallace B. Campbell of Anderson and others are promoting the enterprise. These men are interested in the construction of the White River Light and Power Company's dam at Noblesville, which would furnish power to the proposed road. When the dam is completed a lake will be created covering 400 acres of land, and, with the use of water turbines, 1,100 horsepower will be developed.

A. L. Neereamer, secretary of the Central Electric Traffic Association, announces that a sufficient number of traction lines have joined the association to make the project a success. The interchangeable mileage book for 1,000 miles to be sold by the association is now ready for distribution and will be good on many of the Indiana, Ohio and Illinois interurban roads. The officials think that these books will be of special value to traveling salesmen and others who use the electric roads extensively.

The Hillsdale Telephone Company of Hillsdale has been organized to construct and operate a telephone plant. The project is being promoted by the merchants, with D. B. Highfill as president.

The Jonesville Mutual Telephone Company is to be incorporated with a capital stock of $15,000. The officers are: President, Thos. J. Kobb; secretary-treasurer, W. T. Irvin.

The Seymour Mutual Telephone Company has opened its exchange in Seymour, after passing through a fight lasting over two years. The Seymour Home Telephone Company has operated the only telephone system in Seymour until the present time. In December, 1905, the company advanced the rates 25 cents a telephone, making residence telephones cost $1.50 and the business telephone $2.50 a month. The patrons resented the increase in rates and notified the company that they would disconnect before paying that price. The telephone company was obdurate, with a result that the patrons, including all the merchants, ordered their telephones removed. This condition existed for four weeks, during which time the business part of the city was without telephone service. Finally an agreement was reached whereby the old subscribers were to have their instruments replaced at the former price. By this plan a dual rate was established. In December, 1907, the company again notified its patrons that the price of telephone material had increased until it was necessary to increase the rate, as per notices of a year previous. The patrons again rebelled and organized the mutual telephone service, which has just opened its exchange. The Central Union Telephone Company aided the merchants in their new organization in order to get control of the long-distance business. The new company is now making a strenuous effort to get control of the county lines now operated by the Home Telephone Company, and if it fails it will enter upon the work of building new lines to cover the county at once. S. S.

ILLINOIS

Peoria, September 5.—The purchase of the Cairo street railway from the Halliday estate by the Illinois Traction Company is said to be a step in the acquisition of control of roads in southern Illinois by the traction company, for the purpose of extending a network of lines throughout that part of the state. The consideration is said to have been $550,000.

Representatives of the Christian County Telephone Company and the Central Union Telephone Company will meet in Taylorville Monday in an effort to effect a merger.

The Sandwich Electric Company of Sandwich has been incorporated and will handle electrical apparatus. It is capitalized at $75,000, and the incorporators are S. P. Sedgwick, E. F. Ledoyt and H. O. Rugh.

The Chatsworth Electric Company, capitalized at $25,000, will furnish Chatsworth with light, heat and power. The incorporators are L. A. Walter, J. B. Grotevant and George W. McCabe.

The Federal Engineering Company of Chicago has taken out incorporation papers to do a general mechanical, electrical and construction engineering business. Joseph Westerberg, M. E. Bellinger and Wm. J. Boyd compose the firm.

The Ridgefarm Ice and Coal Company has purchased the equipment of the old Ridgefarm Electric Light Company and will install alternating-current service instead of the direct-current formerly used by the lighting company. V. N.

NORTHWESTERN STATES

Minneapolis, September 5.—Work has commenced on the erection of the power house for the Royalton Power and Light Company of Royalton, Minn. Russell Baker of Brainerd, Minn., has been engaged as superintendent.

A vote will be taken November 3d on the proposition to issue $500,000 bonds for the erection of a municipal electric-lighting plant at Minneapolis.

If the pay-as-you-enter cars are a success in the Twin Cities, it is probable that the Duluth Street Railway Company will adopt them at Duluth, Minn.

The Billings and Cooke City Electric Railway Company of Billings, Mont., is to be incorporated with a capital stock of $3,000,000 for the purpose of building an electric railway and telephone lines between Billings and Cooke City. George E. Savage of Butte, Mont., heads the incorporators.

The power plant of the Economy Electric Power and Light Company at Virginia City, Mont., will begin operating about September 10th.

The power plant of the Alta-Montana Company at Jefferson City, Mont., is to be rehabilitated to furnish power to the Elkhorn mines.

The Fargo and Moorhead Street Railway Company uses a special car, designed by Manager Brown, for transporting live stock to the fair grounds from Fargo, N. D. It is drawn by a Brill snow plow, equipped with two GE-67 motors.

The franchise for the street railway in Grand Forks, N. D., has been turned over to the promoters, and efforts are being made to raise $60,000.

If the City Council of Wahpeton, N. D., grants a franchise to the local electric-light company, the local plant will be taken over by the Otter Tail Power Company, which is building a dam at Fergus Falls, Minn.

The Black Hills Traction Company of Deadwood, S. D., is preparing to complement its plant by the addition of a 1,000-horsepower auxiliary steam plant.

The Ruder Brewing Company of Wausau, Wis., is about to run its plant with individual electric motors.

The Hebron Telephone Company of Hebron, Iowa, has been incorporated for $5,000. H. E. Edmondson is president.

H. O. Korf and others have incorporated the Rural and Four-City Telephone Company of Mitchellville, Iowa, with a capital stock of $50,000.

An ordinance granting a franchise to the Farmers' and Merchants' Telephone Company at Marshalltown, Iowa, has been adopted by the City Council.

F. E. Rebman, manager of the city telephone exchange at Brookings, S. D., has resigned and will go with the Interstate Telephone Company of Sioux City, Iowa.

The Tri-State Telephone Company has bought the exchange of the Thief River Falls (Minn.) Telephone Company and rural lines extending to Greenbush, Roseau and Plummer, Minn. The service will be extended and improved. R.

WESTERN CANADA

Winnipeg, September 5.—The Manitoba Telephone Commission is experiencing some trouble in building its long-distance telephone system throughout Manitoba. A scarcity of supplies is delaying the work somewhat, and to add to the trouble experienced linemen are almost unobtainable. Another delay is caused at railroad crossings, for permission to cross any railroad tracks has to be obtained from the Railroad Commission at Ottawa.

The British Columbia Electric Street Railway Company, with head office at Vancouver, B. C., has notified the authorities of the municipality of Hastings that it will extend its lines through that municipality providing a subsidy of $51,000 is provided, part in cash and part in property.

Only $55,000 worth of Manitoba government telephone bonds were disposed of as a result of the recent advertising. Hon. J. H. Agnew, provincial treasurer, has left for eastern cities for the purpose of interesting financial concerns in the purchase of the remaining $345,000 of bonds.

The contract has been awarded to Seaman & Pananen, Port Arthur, Ont., for the construction of a dam on the Current River to provide additional water storage for the electric plant. The dam will be 25 feet high and 300 feet long and will cost $18,000. Inquiries may be addressed to J. McTeigue, city clerk of Port Arthur.

South of Estevan, Sask., the farmers have organized a rural telephone company, of which W. C. Howland will be president and manager, and John Morris, secretary-treasurer. The authorized capital of the company is $10,000, and 11 miles of pole line will be built as a start and extensions made when required. Connection with Estevan will be obtained by a long-distance line built by the Saskatchewan Telephone Company.

The ratepayers of Fernie, B. C., will be asked at an early date to vote on a by-law providing for a municipally owned electric-light system. The Crow's Nest Pass Electric Light and Power Company, which operated a plant before the recent fire, which destroyed the town, has decided not to reconstruct the system, but offers to turn over its franchise to the city and construct a system to be owned and operated by the town. If the ratepayers decide against a municipally owned system, several capitalists are said to stand ready to equip a system and sell light and power. Mayor Tuttle may be addressed.

At the annual meeting of the British Columbia Street Railway Company, held in London, England, recently, $4,280,000 was voted by the directors for improvements and extensions. Of this amount $200,000 will be expended on new offices in Vancouver, B. C. New freight sheds will be erected in Vancouver sufficient to accommodate the business from the Lulu Island and Westminster lines. Extensions will be started, as soon as the arrangements can be made, of lines running through the municipality of South Vancouver. The Westminster line from Vancouver will be double-tracked as far as Central Park. The last three miles of the line running into New Westminster will be relocated and the present 10 per cent. grade changed for one of 2½ per cent. Contracts have already been let for the first 38 miles of the Chilliwac line and tenders for the remaining 24 miles will be called as soon as the Sumas dyking scheme is sufficiently advanced. The Canadian Pacific Railroad is rapidly completing the Westminster-Eburne branch, and as soon as the steel is laid the British Columbia Street Railway Company will electrify the line and operate it in conjunction with the rest of its system.

Four more radio-telegraph stations will be established in British Columbia before the end of the present year, and the Dominion government is now considering sites upon which to erect these stations. The success of the stations at Cape Lazo, Point Grey, Pachena, Estevan and Victoria, which have been in operation for the past six months, has induced the government to proceed with the execution of the original plan of erecting 10 stations. The new stations will include one at Prince Rupert, the Pacific Coast terminus of the Grand Trunk Pacific; one at the northern end of Vancouver Island, and one on Moresby Island in the Queen Charlotte group. Since the stations now operating were built the government has received many suggestions from shipping men as to the sites for others. At present the Japanese company's six liners communicate directly with Victoria when 200 miles out at sea. The Pacific Coast Steamship Company's fleet was among the first of the coastwise fleets to be equipped with wireless, and now about 10 of the steamers plying between Seattle and Alaska are provided with wireless-telegraph apparatus. The Canadian Pacific Railroad Company is at present considering a proposition from the United Wireless Company to equip all its vessels, and orders have been given by the Inland Navigation Company for installations on all the vessels of its fleet, so that it may safely be said that radio-telegraphy has attained a firm hold along the Pacific Coast. R.

PACIFIC SLOPE

San Francisco, September 2.—While there is very little construction of the larger sort actually under way at present, there are several important plants on which work is expected to start within a few months. It seems pretty well understood that some sort of a working agreement will be reached between the United Railroads of San Francisco and the Stanislaus Power Company which will lead to the completion of the latter company's large plant on the Stanislaus River. In fact, it is officially stated that negotiations are under way for the complete absorption of the power company by the street-railway company.

The Kings River Power Company, the Los Angeles corporation which has been making extensive appropriations of the waters of Kings River in Fresno County, Cal., for power purposes, has selected three power-house locations in that county. These will be about midway between San Francisco and Los Angeles, and the promoters of the company give out that power will be transmitted in both directions. As water for power purposes is very scarce in Southern California, and as there are a number of larger streams much nearer San Francisco, the belief is expressed that the power developed by this company will be used to supplement that developed on the Kern River for the operation of street railways in and about Los Angeles. If so, the power will have to be transmitted about 600 miles.

R. W. Hersey, acting for the Hersey Electric Company of San Jose, has filed a notice of appropriation of 50,000 inches of water in the Tamarack Valley in Tuolumne County, Cal., and has also located a reservoir site in that county. The water will be used for the generation of electric power and afterward for irrigation purposes.

The City Council of Ashland, Ore., has authorized the issue of $80,000 in bonds and will proceed with the construction of the municipal electric power plant in Ashland Creek Canyon according to the plans made by Frank C. Kelsey of Portland, Ore. Action has also been started for the amendment of the town charter to permit of a further issue of bonds to the amount of $30,000 for the extension of the work.

The Northern California Power Company, Consolidated, has been incorporated in San Francisco with an authorized capital stock of $10,000,000 to take over various hydro-electric propositions in the northern part of the state. The incorporators are E. H. Nuhrenberg, E. E. Mead, J. Feuler, C. B. Morgan and Dudley C. Bates.

The Grand Canyon Electric Light and Power

Company has secured a franchise and will install an electric-lighting plant at Williams, Ariz.

Within the last few days ordinances have been introduced in the city councils of Portland, Ore., Seattle, Wash., and Tacoma, Wash., providing for the putting of all electric wires under ground at an early date.

The Utah Light and Railway Company has notified the City Council of Murray, Utah, that it plans the reconstruction of its entire electric-railway line from Salt Lake City to Murray. The company has applied for additional franchises in Murray. A.

PERSONAL

Mr. C. Q. Richmond has been appointed manager of the Berkshire division of the New England Investment and Security Company's electric-railway systems.

Brig.-Gen. James Allen, chief of the United States Army Signal Corps, has crossed the Atlantic to attend the international electrical congress at Marseilles, France, September 14th to 19th.

Dr. Louis Bell, who has spent the summer in Europe studying lighting methods, is to have charge of the new department of "commercial illuminating engineering," which the Edison Electric Illuminating Company of Boston has established in connection with its business. He will give the company's customers expert advice gratis on installation and equipment matters.

Mr. Earle T. Hobart of Brookline, Mass., a graduate last June of the department of mechanical and electrical engineering at Cornell University, and subsequently an employe of the General Electric Company at Lynn, started September 1st for Pekin, China, where he is to establish and equip a department of electricity in the College of Science in that city. He is accompanied by Kuei Ling Wu, secretary of the Chinese Board of Communications, and will make several stops at cities en route across the United States for the purpose of purchasing some of the equipment.

Gerald and Perry Gregory, two youthful Chicago balloonists, the sons of Charles E. Gregory, founder of the Gregory Electric Company and president of the Guarantee Electric Company, Chicago, were injured badly when the balloon in which they had started from Columbus, Ohio, struck a freight car at Niagara Falls, where it came to earth. The balloon in which the boys were riding was the Ville de Dieppe, the property of the boys' father, and was one of those which took part in the Chicago balloon race on the Fourth of July. The boys, in company with Capt. A. E. Mueller, the pilot, left Columbus in hopes of being able to establish a new flight record. Mr. Gregory saw the party off, and came back to Chicago, expecting that the balloon would land near the city. "A change of wind was undoubtedly encountered," he explained, "or they would not have gone east. I received word that the gas bag had failed them, and, in coming to the ground, the basket struck a box car. Captain Mueller has a sprained back and minor scalp wounds, while Perry had his back severely sprained, but his brother Gerald escaped with scalp wounds. Perry was taken to a hospital in Niagara Falls."

Mr. Frank N. Boyer, assistant manager of the Chicago office of the General Electric Company, is in Southern California, accompanied by Mrs. Boyer, to enjoy a good vacation, which has been amply earned by many years of hard and continuous work. Mr. Boyer, who is one of the best known and best liked of western electrical men, affectionately termed "Pop" Boyer, has been active in the electrical business for many years. He became connected with the Chicago office of the Edison General Electric Company in 1889, and before that was superintendent of the Edison Light and Power Company of Reading, Pa. When the General Electric Company was formed in 1892 he was made assistant manager of the supply department in Chicago, and in 1895 he was made manager of the department—a position he still holds. In May, 1908, he was promoted to be assistant manager of the office, succeeding Mr. James W. Johnson, who was made manager of the Chicago office after the resignation of Mr. B. E. Sunny. Mr. Boyer ranks among the most prominent men in the supply end of the electrical business in the United States, and few men have a wider acquaintance among electrical men than he enjoys. He is a tremendous worker, and his friends rejoice that after years of unremitting effort he has been induced to lay aside business cares for a period to obtain the rest and recreation which he deserves.

FRANK N. BOYER

ELECTRIC LIGHTING

The Public Service Company of Chickasha, Okla., contemplates increasing the capacity of its electric plant.

Under the direction of Mr. W. B. Foshay as manager, the power and wire plants of the Fort Dodge (Iowa) Light and Power Company have been overhauled and enlarged and a complete new switchboard has been installed.

A landslide at Walla Walla, Wash., partially wrecked the power house and for a time left the city without street-railway service or electric lights. A small auxiliary power plant was pressed into service to drive the newspaper presses while the tie-up continued. A heavy rain caused the landslide.

ELECTRIC RAILWAYS

The recent extension of the Murdock lines to Laporte, Ind., makes possible a continuous trolley trip from Michigan City in the extreme northern part of Indiana to Louisville, Ky. In a few weeks a through service of three cars each day will be installed.

The Ohio Electric Railway Company has opened its new interurban line from Lima to Toledo. In a short time the company will inaugurate a through service from Toledo to Cincinnati, the cars running through Lima, Springfield and Dayton to Cincinnati. This will make one of the longest interurban through routes in the country.

The Municipal Traction Company of Cleveland, O., which recently raised the cash fare to five cents after two months' operation at a loss under Mayor Tom L. Johnson's three-cent fare plan, has now announced that three one-cent pieces will be accepted as the fare if the exact change is thus tendered, otherwise the cash fare will be five cents. A minimum number of five tickets will be sold for 15 cents. The officials explain that the only object in abolishing three-cent cash fare was to save the conductors making change, which made it impossible for them to collect all fares.

Semi-annual reports of earnings were made on September 3d to the city of Chicago by the Chicago City Railway Company and the Chicago Railways Company, operating under new franchise ordinances that went into effect on February 1st last year. The former company reports net earning of $496,484.79 for the six months ended July 31st. Of this amount the city's share (55 per cent.) is $273,066.63. The Chicago Railways Company stated $610,083.09 as its net earnings for the five months ended June 30th. The city's share from this company is $335,545.71 and from both companies $608,612.34. Within a year and a half the city has received from the two companies $2,165,422.05.

The Electric Storage Battery Company of Philadelphia has recently closed a contract with the Chicago City Railway Company to furnish and install in the latter company's Plymouth Court substation a storage battery, complete with booster, switchboard and wiring, rated at 4,800 amperes for one hour, it being permissible to discharge the battery at rates up to 9,500 amperes in emergency service. The battery is to be operated on a 550-volt bus. It will be charged at times of light load and discharged as occasion may require on the peak loads. Its location, adjacent to the Loop district of Chicago, will make the battery of value as a reserve in the event of any derangement of the sub-station, high-tension transmission lines or power station.

Articles of incorporation have been issued to the Wisconsin Electric Company with a capital stock of $850,000 and an authorized bond issue of $1,500,000. The new company has taken over the property of the Winnebago Traction Company, which was recently sold under foreclosure. The officers of the new company are: President, Oliver C. Fuller; secretary, Fred C. Best; treasurer, Russell C. Smith, and manager, Clement C. Smith. The company will operate the city lines of Oshkosh and interurban lines in connection with the Eastern Wisconsin Electric Railway Company between Oshkosh and Fond du Lac. Formerly these two companies had been operated by rival interests to the detriment of both properties.

TELEPHONE

At Greeley, Neb., the Central Telephone Company has been incorporated with a capital stock of $50,000.

At Deslodge, Mo., the Lead Belt Telephone Company has been incorporated with a capital stock of $20,000.

The Puyallup Valley Home Telephone Company has been incorporated with a capital stock of $80,000. Its headquarters will be at Puyallup, Wash.

PUBLICATIONS

"It's for the sole" is the punning announcement, objectively illustrated, that heads the September calendar card of the F. Bissell Company, 226 Huron Street, Toledo, O.

Dean Brothers' power pumps, connected through gearing to electric motors, are described in catalogue No. 71, of the Dean Bros. Steam Pump Works, Indianapolis, Ind. The large line of pumping machinery, adapted to electrical drive, includes many types of duplex, horizontal, plunger and piston pumps and air compressors.

Bulletin "A," describing the new Westinghouse Nernst lamps of the single-glower type, has been prepared by the Nernst Lamp Company of Pittsburg. Bulletin "B," describing the corresponding multiple-glower lamps, will be ready shortly. Besides giving the already well-known advantages of Nernst lamps, the first of these bulletins clearly points out the added advantages possessed by the new units, verifying the statements by a photometric curve and a table of comparative economies of various high-efficiency illuminants. The artistic possibilities of these lamps are dwelt on as well as their wide range of adaptability. A complete price list of the different types of Nernst lamps and parts is also given.

The Pittsburg Transformer Company is sending out its 20-page Bulletin No. 623, entitled "Silico-Vanadium Steel." This booklet is of great interest to users of transformers. Its cover is unique, due to the fact that it is an exact photographic reproduction of a sheet of silico-vanadium steel, and so close is the likeness that it is stated that factory experts have mistaken the cover for an actual piece of steel. The bulletin describes the manufacture of this steel from the opening of the ore beds in Minnesota to the rolling of the sheets. In the latter part of the bulletin, which is illustrated with 23 engravings, the company calls attention to the great improvement in Pittsburg transformers, which it states is due to the use of this silico-vanadium steel.

MISCELLANEOUS

A new and ingenious form of slide-rule has been devised by M. J. Eichhorn, 5759 Aberdeen Street, Chicago. The new rule is a trigonometrical slide-rule, which is intended not to supplant the ordinary forms of the Mannheim rules but to supplement them with one having the Eichhorn graduation, which is specially designed for the solution of triangles. The saving of time effected by the use of the new rule, as compared with present methods of solving problems of this class, is the most valuable feature that Mr. Eichhorn has brought about by his mathematical device.

A plan to use the Washington Monument temporarily as a wireless-transmitting mast has been brought to the attention of Secretary Metcalfe by the engineers of the navy department. The bureau of equipment has assured the secretary that it is not only practicable, but that if the station were established, without relaying it would be possible to reach stations in Western Europe and to communicate with the vessels of the American fleet at sea in distant waters. The plan is to use the Washington Monument only temporarily, as sentimental objections might be urged, and if the experiment proves successful to erect a permanent tower of the necessary height, probably about the height of the monument, which is 555 feet.

TRADE NEWS

Messrs. D. C. and Wm. B. Jackson, the well-known consulting electrical engineers and experts, are supervising the inventory and appraisal of the entire property of the New England Telephone and Telegraph Company in the state of Massachusetts. This work requires much personal attention from both these gentlemen, and accounts for the statement made in this journal last week, wherein it was noted that they would devote most of their time to the work in the Boston office. The fact is that they expect to give the Chicago office as much attention as that in Boston.

BUSINESS

The Clarkfield Roller Mills and Electric Light Company of Clarkfield, Minn., has placed an order with the Minneapolis Steel and Machinery Company for an 80-horsepower Muenzel producer-gas engine and suction gas-producer for running its mill and electric-light plant.

The Buckeye Electric Company of Cleveland has just held the most successful annual conference of its officers and representatives it has ever held in its career. There were present during the week, aside from the house officers, 15 branch managers and salesmen of the company, as well as about 10 guests. Everything in connection with the incandescent-lamp business was gone over thoroughly, covering especially the newer types of lamps. The company is starting the season in better shape this year than ever before, the business for August, 1908, being at least 20 per cent. greater than for August, 1907.

The Harvard Electric Company, 66 W. Van Buren Street, Chicago, announces that although its main factory and stock were seriously damaged by a fire which occurred August 28th, it is in a position to take care of all orders. Those in the eastern territory will continue to be filled from the large stock carried by the office at 136 Liberty Street, New York city. The Chicago factory will commence work on September th with a sufficient force to fill all orders promptly, and the Harvard Electric Company has already perfected plans for a larger and more thoroughly equipped building to be completed before November 1st. As the fire occurred late in the month, and practically all of the August orders had been shipped, the company was not greatly inconvenienced, as it otherwise would have been. The fire loss is estimated at $25,000, partially covered by insurance.

The business of the Battery Supplies Company, Newark, N. J., manufacturers of the Gladstone Lalande Battery and the newer type known as the BSCO Battery, has been acquired by the Edison Manufacturing Company, Orange, N. J., together with all rights to the manufacture of those batteries. The former company's name has been discontinued, and the company will be merged with the Edison company. As the features of the Gladstone cell were similar to those of the Edison battery, and as the elements were designed to be interchangeable, the Gladstone Lalande battery will be retired, and cells or renewals should be ordered by the corresponding Edison types. The Edison Manufacturing Company will continue to make the BSCO 350-ampere-hour cell for railroad work, and in addition the same type of cell, with special low-temperature electrolyte, for use where low temperatures affect the ordinary sodium hydrate electrolyte. The BSCO battery will also be manufactured in the 200-ampere-hour size, in liquid-tight, steel and porcelain jars. The Edison Manufacturing Company assures the trade, and all interested in batteries, that the same high standard always maintained in the manufacture of its batteries will be continued, and that all orders placed will have prompt and careful attention.

DATES AHEAD

Association of Edison Illuminating Companies (annual convention), Hotel Aspinwall, Lenox, Mass., September 15th, 16th and 17th.

Colorado Electric Light, Power and Railway Association (annual convention), Glenwood Springs, Colo., September 16th, 17th and 18th.

Arkansas Association of Public Utilities Operators (first annual convention), Little Rock, Ark., September 17th and 18th.

Old Time Telegraphers' Association and Society of the United States Military Telegraph Corps (annual reunion), Cataract-International Hotel, September 16th to 18th.

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

Sons of Jove (annual meeting), Buffalo, N. Y., October 15th and 16th.

American Electrochemical Society (fall meeting), New York city, October 30th and 31st.

Association of Car Lighting Engineers (first annual convention), Chicago, November 16th to 21st.

Chicago Electrical Show (fourth annual), Coliseum, January 11th to 23d, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) September 1, 1908

897,273. Trolley Catcher. Michael G. Delaney, Detroit, Mich., assignor to William Degenhart, Buffalo, N. Y. Application filed August 30, 1907.

An electromagnetic detent is arranged to lock the trolley-rope reel when potential is off the trolley.

897,278. Wireless Telegraphy. Reginald A. Fessenden, Washington, D. C. Application filed October 6, 1906.

The receiver is placed in the secondary of an inductive coupling so that the primary acts to shield it from disturbing influences.

897,279. Means for Generating High-frequency Electric Oscillations. Reginald A. Fessenden, Washington, D. C. Application filed December 17, 1906.

The discharge gap is composed of two metallic terminals, one of them having extremely thin walls presented to the spark which occurs in an atmosphere of compressed gas.

897,280. Automatic Stoking-indicator Mechanism. Robert Forsyth and William W. Hanscom, San Francisco, Cal. Application filed September 15, 1904.

A recording device is driven by a motor through a set of gears.

897,291. Method of Rendering Electrolytic Copper Homogeneous. Marcel A. Jullien and Emile L. Dessolle, Levallois-Perret, France. Original application filed April 4, 1907. Divided and this application filed December 7, 1907.

A polisher having a reciprocating movement is applied against the metal deposited on a rotating cylinder in the vat, so that all parts of the surface receive the polishing action.

897,300. Electric Cable Clamp. Ernest W. Muller, Brooklyn, N. Y., assignor to Hubert Krantz, Brooklyn, N. Y. Application filed February 8, 1908.

The clamp consists of a pair of opposed wedge-like insulators.

897,304. Continuous Track Light and Automatic Signal. John M. Pitney, Jr., Lorain, Ohio. Application filed May 11, 1908.

A lever rigging from the truck bolster causes the headlight to follow the track curvature.

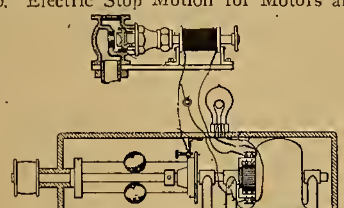
897,318. Ozonizer. Jan Steynis, New York, N. Y., and Henri Chaumat, Paris, France. Application filed March 6, 1907.

Two sets of metal plates, one set stationary and the other adjustable, are separated by glass insulating plates.

897,326. Electric Heat Unit or Device. George H. Wade, Atlanta, Ga. Application filed March 9, 1908.

A heating unit of high temperature coefficient is laid between sheets of mica which serves as a heat register and deflector.

897,350. Electric Stop Motion for Motors and Signal for the Same. Adam Cochrane, Lowell, Mass. Application filed March 21, 1908.



NO. 897,350.—ELECTRIC STOP-MOTION

A valve shut-off is electromagnetically closed when a centrifugal governor on the shaft of a generator attains a cerain speed. (See cut.)

897,355. Electric Block-signaling System. John W. Davis, Los Angeles, Cal., assignor to Mills-Piddington Cab Signal Company, Los Angeles, Cal. Application filed September 20, 1907.

Short auxiliary contact rails are placed additional to the mechanical rails.

897,394. Electromagnetic Locking Device. Charles O. Peters, Winthrop, Mass. Application filed March 30, 1908.

The door latch is released by an electromagnet.

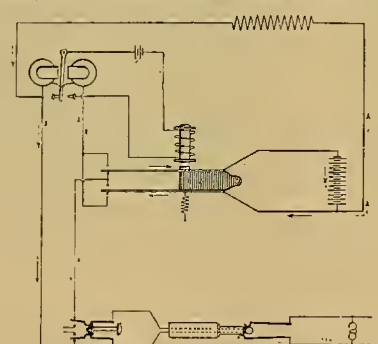
897,401. Electric Signaling System. Harry C. Reagan, Butler, Pa., assignor of one-half to John H. Barrett, Mars, Pa. Application filed May 27, 1907.

The system provides a safety stop by withdrawing the trolley from the wire.

897,410. Carbon Holder. Oscar A. Ross, Chicago, Ill. Application filed July 30, 1906.

The carbon pencil is retained by spring contacts.

897,413. Signaling Circuit. Harry O. Rugh, Sandwich, Ill. Application filed May 2, 1908.



NO. 897,413.—SIGNALING CIRCUIT

An automatic telephone calling circuit is described. (See cut.)

897,454. Telegraphic Transmitter. George A. Cardwell, New York, N. Y., assignor to the Telegraph Transmitting Instrument Company. Application filed August 19, 1905. Renewed January 20, 1908.

A keyboard transmitting circuit is described.

897,455. Cluster Fixture for Electric Lights. John H. Caldwell, Philadelphia, Pa. Application filed December 21, 1907.

The cluster fixture permits the lights to be turned on individually from a central rotating contact piece.

897,457. Hanger for Electric Lamps. George Cutter, South Bend, Ind. Application filed June 6, 1906.

The hanger contains a switch operated by a compression shaft extending through the insulating body.

897,472. Jar for Storage Batteries. Joseph Marx, Buffalo, N. Y. Application filed July 19, 1907.

The rim is reenforced with an extra thickness of hard rubber, which is covered by a lip of soft rubber.

897,475. Alternating-current Motor. Maurice Milch, Schenectady, N. Y., assignor to the General Electric Company. Application filed October 12, 1903. Renewed October 5, 1907.

An auxiliary field is produced at right angles to the principal field.

897,482. Blue-printing Machine. James C. Perham, Glenville Township, Schenectady County, N. Y., assignor to the General Electric Company. Application filed May 12, 1903.

The machine is driven and illuminated by electrical means.

897,492. Electric Switch. Oran O. Rider, Schenectady, N. Y., assignor to the General Electric Company. Application filed June 27, 1904.

An oil-break circuit switch with overload release is described.

897,497. Starting and Speed-regulating Rheostat. Frank J. Seabolt, Schenectady, N. Y., assignor to the General Electric Company. Application filed January 25, 1908.

The rheostat arm covers two rows of resistance contacts, only one of which rows is operative in either direction of movement of the arm.

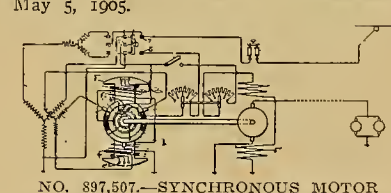
897,500. Condenser. William B. Taylor, Lynn, Mass., assignor to the General Electric Company. Application filed January 5, 1907.

A high-potential condenser comprises alternate conductor plates separated by insulating plates containing dead metalic plates, the whole immersed in oil.

897,501. System of Electrical Distribution. Matthew O. Troy, Schenectady, N. Y., assignor to the General Electric Company. Application filed November 11, 1905. Renewed February 24, 1908.

A three-phase rectification system for use in supplying series arc-light systems is described.

897,507. Synchronous Motor. Ernst F. W. Alexanderson, Schenectady, N. Y., assignor to the General Electric Company. Application filed May 5, 1905.



NO. 897,507.—SYNCHRONOUS MOTOR

The synchronous motor has a field provided with phase-splitting means for purposes of starting, after which the fields are excited by direct current. (See cut.)

897,508. Alternating-current Motor. Ernst F. W. Alexanderson, Schenectady, N. Y., assignor to the General Electric Company. Application filed October 16, 1905.

There are two secondary members of corresponding pole numbers, of which either may be excited from an external source, the other member being short-circuited.

897,514. Latch Mechanism. Paul Behr, Berlin, Germany, assignor to the General Electric Company. Application filed January 23, 1907.

The latch mechanism applies to the release device on a circuit-breaker.

897,524. Block-signal System. Fred B. Corey, Schenectady, N. Y., assignor to the General Electric Company. Application filed November 3, 1906.

The signal system uses alternating currents of different frequencies.

897,525. Electric Switch. Frank C. De Reamer, Schenectady, N. Y., assignor to the General Electric Company. Application filed August 1, 1905.

The switch blades are supplanted by cartridge fuses and terminate in the usual clip contacts. A central reinforcing bar supplies rigidity to the switch structure.

897,531. Block-signal System. Laurence A. Hawkins, Schenectady, N. Y., assignor to the General Electric Company. Application filed February 19, 1908.

This system is operated by alternating current impressed across the rails which are supplied with power through inductive bonds.

897,536. Mercury Meter. Frank Holden, London, England, assignor to the General Electric Company. Application filed January 30, 1907.

Current leads are carried into a mercury chamber in the field of a magnet. A continuous closed duct which ends in the mercury chamber acts as an index tube.

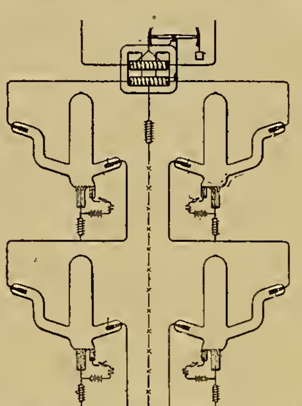
897,537. Electric Controlling System. John D. Ihlder, New York, N. Y., assignor to the Otis Elevator Company, Jersey City, N. J. Application filed July 29, 1905.

The control system is operated by the travel of the car.

897,538. System of Motor Control. Leopold Janisch and Wilhelm Naumann, Berlin, Germany, assignors to the General Electric Company. Application filed March 6, 1907.

The controller for a series motor connects a resistance in parallel with the armature when the controller is moved toward its "off" position.

897,544. Rectifier System. Osias O. Kruh, Schenectady, N. Y., assignor to the General Electric Company. Application filed November 9, 1905.



NO. 897,544.—RECTIFIER SYSTEM

The rectifier system is arranged to supply a series arc-light circuit. (See cut.)

897,545. Single-phase Commutator Motor. Marius C. A. Latour, Paris, France, assignor to the General Electric Company. Application filed March 11, 1907.

By an arrangement of the main field coil connections a commutating field is produced in the space between the adjacent sides of the coils.

897,548. Arc-light Electrode and Method of Making the Same. Charles F. Lindsay, Schenectady, N. Y., assignor to the General Electric Company. Application filed December 10, 1903.

The method consists in partially reducing a mixture containing iron and titanium oxide, grinding and mixing the product and subjecting it in the form of electrodes to a reducing action.

897,559. Switch. Lawrence B. Stevens, Rutherford, N. J. Application filed June 1, 1906.

The switch is provided with locking members.

897,564. Panel Box. Frank S. Wahl, Olean, N. Y. Application filed April 29, 1907.

The panel box is constructed of sheet metal gutter sections.

897,585. Electric Time Switch. Jules Cauderay, Lausanne, Switzerland. Application filed February 4, 1907.

Both clock and switch mechanisms are motor driven.

897,590. Sub-station Protector. Frank B. Cook, Chicago, Ill. Application filed November 8, 1907.

The telephone substation protector has the enclosed grounding electrodes located between the fuse members.

897,607. Automatic Calling-on Signal. William H. Elliott, New York, N. Y. Application filed December 24, 1907.

A stop signal is automatically reported when the section is occupied.

897,614. Cluster-lamp Socket. Charles D. Gervin, New York, N. Y., assignor to the Dale Company. Application filed February 14, 1908.

All the lamp contacts are closed by a single switching operation.

897,657. Electric and Pneumatic Governor. William K. Rankin, Philadelphia, Pa., assignor to John E. Reyburn, Philadelphia, Pa. Application filed December 11, 1907.

The governor contains a pneumatic diaphragm which, under the action of a change in the air pressure, controls the compressor-motor circuit.

897,662. Telegraphic Selective System. Alfred M. Roberts, Buffalo, N. Y. Application filed December 6, 1906.

The system consists of a series of magnets comprising a pair of magnets for each selecting magnet of the preceding series, one magnet of the pair responding to a transmitted plus impulse and the other to a minus impulse.

897,667. Trolley Wheel. Edward P. Sharp, Buffalo, N. Y. Application filed December 26, 1905.

The contact surface has an integrally connected hub.

897,669. Insulator. Frank J. Siegwart, Pittsburg, Pa. Application filed January 3, 1908.

A bighting groove is formed on the outside and across the face of the insulator.

897,670. Electrical Impulse Recorder. Augustus K. Sloan, Jr., Brooklyn, N. Y. Application filed April 22, 1908.

The armature carries an engraving stylus which records the transmitted vibrations on a rotating record blank.

897,674. Terminal for Electric Fittings. Frederick A. Swan, Cliftondale, Mass. Application filed April 26, 1907.

The rosette and socket have projecting horns, over which the wire is looped to relieve the strain on the contact screws.

897,681. Telephone Switch. Clarence Truitt, Moscow, Idaho. Application filed June 8, 1907.

The switch is designed for the control of party-line systems.

897,683. Conduit Cap for Electric Installation. Wheeler H. Vibber, New London, Conn., assignor to the Gillette-Vibber Company, New London, Conn. Application filed February 6, 1908.

A thimble closes the opening in the conduit cap.

897,692. Electric Organ Action. William R. Whitehorne, Brooklyn, N. Y., assignor to the Whitehorne Organ Action Company, Jersey City, N. J. Application filed May 16, 1907.

The organ has a series of keys each provided with a key switch, a series of magnets each controlling the valve of a single pipe, and each having one of the key switches in series with it, and a stop mechanism including a number of multiple-contact switches also in circuit with the magnets.

897,700. Insulating Coupling. Homer Ashbaugh, Indianapolis, Ind. Application filed March 7, 1908.

The pipe centers are eccentrically related.

897,702. Electric Signal System. Anthony A. Barbera, Philadelphia, Pa. Application filed February 28, 1908.

The alarm system is controlled from contact devices located on the locomotive.

897,711. Time Switch for Electric Circuits. Hayden W. Brown, Waterbury, Conn. Application filed April 27, 1908.

The clock work drives a switch block, making contact with adjustable fingers.

897,713. Motor Starter. Anthony J. Burns, Oswego, N. Y. Application filed August 9, 1907.

The motor starter is provided with overload and novoltage circuit-breaking apparatus.

897,716. Transmitter. Jesse T. Curtis, Bement, Ill. Application filed March 25, 1907.

The vibrating diaphragm is drawn into a central cup which contains the carbon capsule, and on which the piston of the connecting rod impinges.

897,718. Telephone Instrument. Wilford R. Daniels, New York, N. Y. Application filed April 10, 1908.

The usual receiver is fitted with branching ear tubes.

897,723. Telephone System. William W. Dean, Chicago, Ill., assignor to the Kellogg Switchboard and Supply Company, Chicago, Ill. Application filed January 22, 1904.

A telephone circuit is described.

897,731. Signaling Device for Telephone Exchanges. Thomas W. Gardner, Nashville, Tenn. Application filed February 15, 1905.

A condenser in the operator's circuit is maintained fully charged by the battery.

897,743. Timer. Clarence N. Isaacs, Newark, N. J. Application filed December 13, 1907.

The end of the contact arm is retarded and the time of engagement between the arm and the terminal rendered substantially uniform independently of the speed of rotation of the shaft.

897,766. Electric Cigar Lighter. Ernest P. Muller, Brooklyn, N. Y. Application filed February 4, 1907.

An oil-soaked dip is arranged to be drawn between a pair of spark terminals supplied through a reactance coil.

897,779. Receiver for Wireless Signaling. Valdemar Poulsen, Copenhagen, Denmark. Application filed March 6, 1907.

The detector has a comparatively large reactance, and upon unbalancing or destroying the condition of resonance in the oscillation circuit, the energy accumulated by resonance is caused to discharge itself suddenly through the detector.

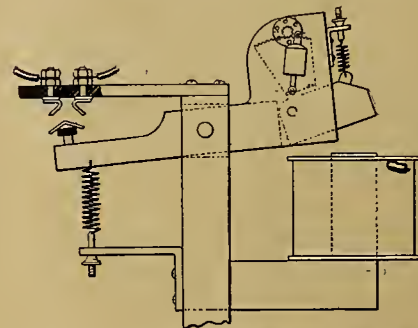
897,800. Lightning Arrester. Charles P. Steinmetz, Schenectady, N. Y., assignor to the General Electric Company. Application filed December 28, 1900.

In series with the spark-gap terminals is a resistance formed of magnetite, the resistance of which decreases when heated.

897,805. Incandescent-lamp Socket. William F. Wegner, New York, N. Y., assignor to Stephen T. Williams, New York, N. Y. Application filed August 20, 1907.

The lamp is inserted by a direct thrust, the screw-threaded contact socket being of yielding construction.

897,812. Inverse Time-limit Relay. Peter Bendmann, Berlin, Germany, assignor to the General Electric Company. Application filed January 18, 1907.



NO. 897,812.—INVERSE TIME-LIMIT RELAY

The magnetic pull required to operate the armature is adjustable. (See cut.)

897,823. Marine Signaling Lamp and the Like. Henry Endall, Southampton, England. Application filed August 5, 1907. Renewed July 27, 1908.

Incandescent lamps are enclosed behind marine lenses and intermittently uncovered by the rotation of a slotted screen.

897,824. Pole Shoe. William R. Everett and Edwin J. Newton, Chicago, Ill. Application filed August 17, 1904.

The pole shoes are formed with extended arms, each overlapping the arms of the next shoe.

897,831. Means for Preventing Offset in Connection with Printing. John Hergesheimer, Philadelphia, Pa., assignor to the Curtis Publishing Company, Philadelphia, Pa. Application filed May 13, 1908.

An electric beater and a single insulated conductor or discharger are arranged in proximity with the moving sheets, and the latter supplied with a source of unidirectional high-tension current.

897,833. Reversible Galvanic Battery. Harry C. Hubbell, Orange, N. J., assignor to the Portable Electric Safety Light Company, Newark, N. J. Application filed June 2, 1906.

One plate comprises dry-pressed tablets of powdered nickel hydrate and powdered oxide of silver, the other plate consisting of dry-pressed tablets of cadmium oxide and nickel hydrate.

897,852. Safety Fuse. Joseph Sachs, Hartford, Conn., assignor to the Sachs Company, Hartford, Conn. Application filed May 18, 1907.

The fuse comprises a number of separately insulated and sheathed conductors connected in multiple to common electrodes. By means of springs a tension is effected to separate the conductors immediately upon their becoming disrupted.

897,858. Automatic Circuit-breaker. Henry P. Ball, New York, N. Y., assignor to the General Incandescent Arc Light Company of New York. Application filed January 31, 1903.

The oil-break switch is biased to open when closed, having its open position between two closed positions. The switch movement is electrically controlled.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired September 8, 1908:

459,013. Telegraphic Transmitting Apparatus. M. Martin, Malden, Mass.
459,024. Mounting for Motors of Electric Cars. S. H. Short, Cleveland, Ohio.
459,088. Electric-light Fixture. E. T. Greenfield, New York.
459,090. Controlling Mechanism. C. R. Pratt, New York.
459,091. Mechanism for Operating Dampers or Similar Valves. J. V. Short, Easton, Pa.
459,100. Incandescent Electric Lamp. E. P. Roberts, Cleveland, Ohio.
459,127. Electrode for Chairs. G. W. Overall, Memphis, Tenn.
459,205. Telephone Receiver. J. H. Howard, Medford, Mass.
459,214. Telephone. J. H. Howard, Medford, Mass.
459,219. Electric Switch. L. D. Castor, Philadelphia, Pa.
459,222. Electrically Operated Brush. F. A. Lehmann, Washington, D. C.
459,229. Electric Elevator. H. H. Blades, Detroit, Mich.
459,323. Electric Contact Apparatus. C. Weuste, Duisburg, Germany.
459,366. Armature for Dynamo-electric Machines or Motors. R. Lundell, Brooklyn, N. Y.
459,367. Commutator Brush and Holder. R. Lundell, New York, N. Y.
459,368. Commutator Cylinder and Method of Making the Same. R. Lundell, New York, N. Y.
459,378. Electric Conductor. E. D. McCracken, Alpine, N. J.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, SEPTEMBER 19, 1908 No. 12

SPECIAL STREET LIGHTING IN VARIOUS CITIES

Light has come to be recognized as an advertising medium of considerable value ever since electric lighting came into vogue. First, in making a bright store, then in making the window display attractive by night, next in the use of electric signs to draw people from nearby, and finally in the general illumination of a business street to give an appearance of brilliancy and prosperity to the entire thoroughfare. If carefully planned the liberal use of electric light in each and all of these ways has well repaid itself in increased volume of trade, not only in the evening, but during regular trading hours as well.

In a number of American cities the special electric lighting of business streets has been taken up with marked success not only to the merchants on these streets, but to the lighting company supplying the current and to the community as a whole. Among these cities may be mentioned St. Paul, Denver, Wichita, Grand Rapids, Minneapolis, Los Angeles, Toledo, Columbus (Ohio) and San Antonio (Tex.). Quite a variety of systems have been used in these installations. A common idea is to string incandescent lamps across the street in festoons. In other cases incandescent-lamp clusters have been mounted on ornamental lamp posts. Arc lamps of all kinds have been used, from the old open and enclosed types to the magnetite and even flaming arcs. In general the aim has been to get not only an abundance of light but an artistic effect as well—something beyond and apart from the general street lighting required in any event.

A street illumination of this order with a number of distinctive features has recently been put into operation in Chicago. It is along Milwaukee Avenue, for some four blocks, near the crossing of Chicago Avenue. In this installation use has been made for what is believed to be the first time of multiple tungsten lamps for general street lighting. Five lamps are mounted on an ornamental post. Fifty of these posts have now been set up in this section of the avenue.

Milwaukee Avenue is the great highway leading to the populous Northwest Side. It has a great volume of traffic both on the street and sidewalks as well as on street cars. To keep the people from going downtown to do their shopping it was necessary to make the street more attractive. As soon as the rehabilitation of the street-railway tracks was nearly completed, the question of more effective street lighting was taken up by the West Side Commercial League, which agitated the subject among its members and other merchants on the avenue.

Night View on Milwaukee Avenue, Chicago

Day View on Milwaukee Avenue, Chicago

SPECIAL STREET LIGHTING WITH MULTIPLE TUNGSTEN LAMPS

An offer from the Commonwealth Edison Company was obtained for installing, lighting and maintaining artistic lamp posts on a two-year contract basis. The league secured the consent of the City Council and helped obtain many signatures of the individual merchants to the scheme. Each merchant pays at the rate of $2.10 per week for each lamp post in front of his premises. All contracts were made for two years, after which the cost will be reduced to cover lighting and maintenance only, as it is calculated by the company that at the end of that time the initial installation will have been paid for. The lamps are lighted from sunset to midnight on Saturdays and from sunset to 10 p. m. on other days.

Each of the ornamental iron posts has a slightly tapering octagonal body supporting four brackets from which the four pendent lamps are suspended. These lamps are 10 feet from the sidewalk level. On top of the post is an inverted lamp with a somewhat larger alabaster diffusing globe than those on the pendent lamps. The lamps, however, are all 60-watt multiple tungsten lamps and operate on the 220-110-volt, Edison three-wire direct-current system.

The posts are set for the most part 50 feet apart so as to be on the extended dividing line between adjacent stores. As nearly all the stores have a 25-foot front, this spacing of the posts makes each merchant pay for one-half a post. In very few cases are the posts set opposite the entrance of a store where they might be an obstruction to the delivery of goods by wagon. Milwaukee Avenue, being a diagonal street, the lots are not uniformly laid out to be exactly opposite each other on the two sides of the street. Therefore the new posts are not uniformly opposite each other. As a few of the merchants did not sign contracts because their leases had almost expired, a few gaps in the regular order of the posts are to be found. These irregularities, however, do not detract from the general effectiveness of the lighting scheme.

A marked feature of this illumination is that it does not clash with the window displays, but rather enhances their value. There is not too great a flood of light on the street and sidewalks to "kill" the window lighting, as is done in some systems, but just enough light to make a brilliant street, and this light is of such a color and diffusive quality as to harmonize with the window lights.

In the illustrations shown herewith the general arrangement as well as the ornate appearance of the posts is quite well brought out. The night view was taken with an exposure of about 12 minutes. This accounts for the appearance of the two long streaks in the picture that look as if they were luminous trolley wires. They were actually caused by the lights of the large number of trolley cars that continually passed in both directions while the picture was being taken.

The merchants are well pleased with the result, both as to the attractive appearance of the street and the increased trade brought about thereby.

The Permanent Downtown Association of San Francisco has awarded to Thomas Day & Co. of that city the contract for 169 ornamental electric lamp posts. The Mission Promotion Association, the Haight and Ashbury Club, the South of Market Street Club and the Ellis Street Property Owners' Association have decided to adopt the same style of lamp for their street-lighting plans.

St. Joseph, Mo., has entered the contest for the honor of being the best lighted city in the United States. Since last April Felix Street, between Third and Sixth streets, has been St. Joseph's best lighted thoroughfare. The beauty and usefulness of the lights in this district have served to convert the business men of the downtown district. The city has voted $15,000 in bonds for conduits and cables and the property owners are to buy and maintain ornamental lamp posts carrying five high-efficiency lamps each. Thirty blocks are to be lighted in this manner. Four lights on each post are to burn till midnight and one all night.

The accompanying picture is a night view of West Walnut Street, Des Moines, Iowa, illuminated by flaming arcs and festoons of incandescent lamps.

Des Moines is fast becoming an electric city. Business men are outlining their buildings and hundreds of electric signs are in use. A number of the leading merchants in the vicinity of West Fourth and Walnut streets have for some time been maintaining flaming arc lamps in front of their premises, for the better lighting of the neighborhood in the evening. These merchants, not satisfied with having the brightest street in the city, have recently installed several thousand incandescent lamps, arranged in festoons, as shown, to give the street a more decorative appearance.

Taken at nine o'clock in the evening on August 25th, the picture serves to indicate the general appearance of the illumination and the design of the arches, which were installed by the Des Moines Electric Construction Company, the current being furnished by the Des Moines Edison Light Company.

The result of this and other manifestations of the up-to-date business enterprise of this neighborhood is that the street is thronged for hours every evening with people who are there for the purpose of spending their money in the purchase of goods and for amusement. Des Moines merchants and business men say that the illumination is good advertising and also that it supplies a good way to "boost" the city.

STREET ILLUMINATION IN DES MOINES

MR. HARRIMAN'S ELECTRIC-RAILWAY PROJECTS

The indications are that the next developments in a large way in the electrical field on the Pacific Coast will concern transportation problems in and about San Francisco. Within the last few days extended conferences have been held in that city between E. H. Harriman, the prominent transcontinental railroad man, H. E. Huntington, president of the chief electric-railway companies in Southern California, and a number of other railroad men identified with Mr. Harriman in various roads. Mr. Harriman admits that he is expecting a great expansion of the use of electricity in railroading, and it is common report that he has already planned to make his expectations come true.

On September 3d the City Council of Alameda, Cal., sold to the Southern Pacific company, one of Mr. Harriman's railroads, the needed franchises for electric lines for the connecting up of the Southern Pacific suburban systems on the east side of San Francisco Bay when these lines are electrified. A few days later the Southern Pacific company put three surveying parties in the field south of San Francisco, where the company recently became an important factor in the electric-railway field. It is also announced that the Central California Traction Company of Stockton, Cal., will extend a line to Sacramento, which may or may not be a Southern Pacific move. The general idea is that the Harriman interests have decided to make the long-threatened move in electric-railway matters in Central California, and that Mr. Harriman has called to his assistance the experience of Mr. Huntington, who has built up the most extensive interurban system on the Coast in Southern California.

TO INCREASE ARMY SIGNAL CORPS

The movement to increase the strength of the army Signal Corps which has taken definite form in the shape of a bill now before the military committee of the Senate, has received added impetus from the flights made at Fort Myer last week, showing the utility of aerial navigation to aid the army in time of war. The activity displayed abroad in securing aerial navies and the necessity of constant communications between the various units of an army are other factors.

The Signal Corps is now a staff corps and has a quota of 1,200 officers and men. The bill awaiting the action of Congress provides for a full peace strength of 2,500 officers and men, and if passed will put the Signal Corps in the line of the army. Military experts estimate that 2½ per cent of the entire force of an army is the minimum that can safely be used for signal work. The present strength of the Signal Corps is slightly more than one per cent. of the authorized strength of the army in time of war.

The officers and men of the Signal Corps require a great amount of special training. Their work involves the establishment and maintenance of cable, telegraph, and wireless systems, the installation of fire control systems in all fortifications, military aeronautics, cable and telephone equipment for army posts and target ranges, electrical equipment, participation in military maneuvers, and all signal work.

The construction of the Washington-Alaska military cable, its maintenance, the operation of the Philippines cable and of telegraph and wireless lines in Alaska, Cuba, the Philippines, and the United States, has required the services of a large percentage of the force of the Signal Corps.

SUSQUEHANNA RIVER POWER DEVELOPMENT

Although the McCall's Ferry power plant, located 35 miles from York, Pa., on the Susquehanna River, will not be fully completed before 1910, it is hoped that sufficient machinery will be installed to enable the plant to furnish current within a year. A force of 500 men is working night and day, and 2,500 feet of concrete wall has been built across the river, impounding the water for a distance of from 7 to 15 miles.

When finished the plant, turbines and machinery will represent an expenditure of about $12,000,000. Thirteen wheels will be installed, with an estimated capacity of about 130,000 horsepower. In order to overcome any difficulties from the formation of ice a wall, extending 100 yards from the Lancaster County side and requiring 250,000 tons of quarried stone, has been built. Mr. George R. Willis has been prominent in the waterpower development.

USE OF ELECTRIC HEAT IN MAKING CASTINGS

In the process of green-sand molding vertical channels called "risers" are led from the mold to the top of the flask, where they end in deep bowls hollowed out of the surface of the sand. When the mold is poured, an excess of the molten iron finds its way up through these risers and

Fig. 1. Cross-section of Mold and Heating Coil
USE OF ELECTRIC HEAT IN MAKING CASTINGS

forms little reservoirs in the bowls. Then, as the main body of the mold contracts, due to shrinkage following cooling, the iron in the risers is fed down into the mold, supplying the deficiency. The ferrostatic pressure of the column of molten iron also assists in making a homogeneous casting, displacing any gas bubbles and driving them into the vents.

However, the risers and the pouring holes, which latter serve a function similar to the former while the casting is solidifying, are of relatively small diameter, and so their contents are the first to cool. The result is a defeat of the original purpose, since the pouring holes and risers solidify before the mold proper has received all the iron necessary to compensate for its shrinkage.

The evident solution is some means of supplying heat to the risers and pouring channels to keep them fluid until the main body of the casting has set, and Harry E. Diller of Oak Park, Ill., has preferred to do this electrically. He was recently granted a United States patent on a method which contemplates making the molten iron of the riser the secondary of a step-down transformer, supplying the heat radiated by the large current traversing the resistance of the iron.

The method is well illustrated in the accompanying sketches. The sand mold, when rammed up, exhibits a cross-section as shown in Fig. 1, the pouring receptacle connecting with the mold

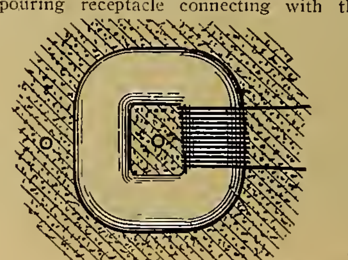


Fig. 2. Plan Section of Mold, Showing Heating Coil
USE OF ELECTRIC HEAT IN MAKING CASTINGS

cavity by two small inlets. Linked with one of these inlets is an iron core wound with a primary insulated to withstand a high temperature. A view of this ring-shaped core with its winding (Fig. 2) is shown surrounding one of the risers, and it appears in cross-section in Fig. 1. If, after pouring, the metal reaches the level in the receptacle indicated by the dotted line and alternating current is supplied to the primary, a varying magnetic flux is set up in the core, which, it will be noted, links a secondary circuit of a single turn formed by the metal in the two risers and the larger bodies. A large current is thus generated, and this current produces most of its heat at the regions of greatest resistance, viz., the slender risers, maintaining them in a molten condition. As cooling goes on in the larger mass of the mold cavity iron is fed down to supply the shrinkage through the unimpeded riser. The result is effected without any part of the electrical circuit coming in contact with the molten iron.

Another method suggested by the inventor is to lead the two terminals of a step-down transformer or source of large current into the pouring receptacle and the mold cavity, respectively, thus completing the circuit for a heavy current through the riser. Of course this plan is equally adaptable for alternating or direct current. An electrolytic generator capable of supplying large currents at a low potential would serve for the latter purpose.

NEW BRITISH PATENT LAW

[From the London correspondent of the Western Electrician.]

A good deal of controversy has been going on both in America and on the Continent with regard to the effect of the new Patents Act. [See Western Electrician of August 8, 1908, p. 99; September 5, 1908, p. 169.] The reason for this is that last month the clause with regard to the revocation of foreign patents not worked in this country came into force. Perhaps intentionally, in some quarters, it has been taken for granted that any foreign patent not so worked will become void automatically; but those who know the terms of the Act are aware that an application must be made by interested persons for the revocation of any such patent. The machinery for this is somewhat tedious and involved, but it is clearly defined, nevertheless.

Probably the greatest activity in connection with the operation of the new Act in electrical circles has been on the part of the makers of metal filament lamps, and it is stated that for the working of foreign electrical patents some 30 sites have been negotiated for. A factory is under construction at Hammersmith (London) for the manufacture of Osram lamps, and a large new factory is being built in Middlesex for the manufacture of a German lamp of this character. With regard to American patents, in one case the lamps are already being made in existing works, while in another arrangements have been made with a British firm of lamp makers to carry on the work.

WORKING FOR I. C. ELECTRIFICATION

A weapon to induce the Illinois Central Railroad to electrify its tracks within the city limits of Chicago has been discovered if the City Council can be prevailed upon to withhold valuable permission when the railroad asks for rights to cross 15 streets, between Kensington and the city limits, on its new line to Hegewisch and Gary, Ind. To urge the firm action of the Council toward the railroad company South Side civic committees are holding mass meetings to voice their demands.

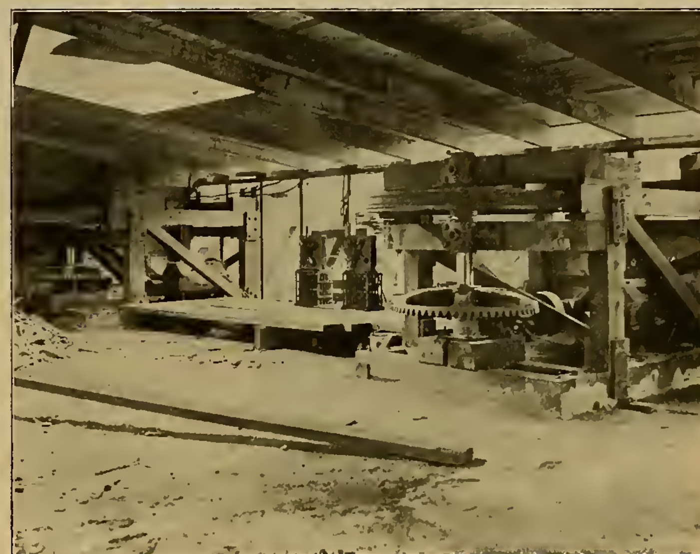
While the railroad is suing for favors the citizens think the time is ripe to require that the spoilation of some of the best residence sections of Chicago by the 500 trains each day over the Lake Front right-of-way should be stopped without delay. Civic improvement associations, citizens' leagues, women's clubs and the newspapers have combined forces in the effort to make the Illinois Central officials reconsider their recent statement that electrification was a matter of the far future. A monster petition for 150,000 signatures of property owners is being circulated and will be presented to the Council for its guidance when the time comes to grant the permission to cross the streets desired by the railroad.

CABLE HAULING ON THE NEW MANHATTAN BRIDGE

The four huge cables that will support the new Manhattan Bridge, connecting the Boroughs of Brooklyn and Manhattan, are now being hauled into place. Each cable will contain 37 strands of 256 wires each, a total of 9,472 wires in each cable, which must be strung wire by wire. The enormous amount of work involved will be done by machinery driven by electric motors.

The stringing of the wires in each cable is accomplished by means of two traveling sheaves

View of Brooklyn Anchorage, Showing Hauling Sheave Starting Across



Two of the Motors, with Driving Mechanism

CABLE HAULING ON THE NEW MANHATTAN BRIDGE, NEW YORK

carried on opposite legs of an endless steel rope. Each sheave consists of a three-foot grooved wheel fastened to the hauling rope by means of wrought-iron brackets. The hauling rope is three-quarters inch in diameter and runs above the position of the bridge cables on heavy rollers supported on uprights on the temporary foot bridge. There are five of these hauling-rope supports on the center span, two on each end span and one on each tower.

The hauling sheaves move back and forth across the bridge from anchorage to anchorage, a distance of 3,223 feet. They are attached one to each leg of the hauling rope, so that they move in

View from Top of Anchorage

CABLE HAULING ON THE NEW MANHATTAN BRIDGE, NEW YORK

opposite directions, one crossing the bridge as the other returns.

The wire is delivered to the bridge on enormous reels or spools, weighing three tons each. Half of these reels are placed at each end of the bridge. The end of the wire from a reel at each end of the bridge is put over the hauling sheave at that end and fastened to the anchorage. The machinery is then started and the sheaves move across the bridge, unwinding one wire from each reel. Two wires are thus strung by each sheave every time it crosses the bridge. When the sheave reaches the opposite side of the bridge the bight of the wire is taken off and made fast to that anchorage, and a new wire hauled from that side on the return trip.

The wires are laid in temporary saddles of four grooved pulleys at each anchorage. As the hauling of each strand of 256 wires is completed the wires are bound together at intervals, and the strand is lifted from the temporary saddle by means of a chain hoist and laid in its proper place in the permanent saddle. Two strands of each cable are wound simultaneously by the two sheaves of each hauling rope.

There is a separate hauling mechanism for each of the four bridge cables, so that they are strung independently of each other. Delays are therefore not cumulative. The delays in one cable affect that cable alone, and the work proceeds on the others. This results in a very considerable saving of time.

Each hauling rope is driven by a 50-horsepower, 220-volt Crocker-Wheeler form W motor. This is the type of motor designed by the Crocker-Wheeler Company of Ampere, N. J., for rolling-mill duty, and is well adapted to work of this kind, where sudden overloads and frequent starting and stopping are likely. The motors are fully enclosed and capable of withstanding all kinds of weather and rough handling. The driving mechanism is shown in one of the accompanying pictures. Each motor is geared to a countershaft at a ratio of 5 to 1, and the countershaft is bevel geared to the driving shaft at a 5 to 1 ratio. On the driving shaft, above the gears, is a wood-lined, grooved, six-foot traction wheel, which drives the hauling rope. A five-foot idler wheel is also provided, so that the hauling rope passes the traction wheel twice, to produce the necessary grip.

The hauling rope moves at a speed of approximately 480 feet per minute. It carries the sheaves across the river in about seven or eight minutes. Allowing for the time used in attaching wires at each end, about three trips are made per hour. It is estimated that at this rate the work of hauling will occupy four months, some time being consumed in fixing guide wires for each strand and in adjusting the wires after they are hauled.

The driving motors are all located on the anchorage at the Brooklyn end of the bridge. The reels of wire, as already stated, are stored at both ends of the bridge. The wire was delivered by John A. Roebling's Sons Company, the same concern which delivered the wire for the old Brooklyn Bridge 30 years ago. The work of building the cables is being carried on by the Glyndon Contracting Company of New York city.

The hauling equipment for this bridge differs from any previous attempt. In hauling the cables for the Williamsburg Bridge two steam engines were used, connected to the same driving shaft. It later became necessary to cut this shaft and use the engines independently, to avoid cumulation of delays. Even with that arrangement, only two cables could be hauled simultaneously. The Glyndon company's plant has double the capacity, besides being electrically instead of steam driven, with the consequent ease of manipulation and control.

METHODS AND COSTS OF BUILDING A CONDUIT FOR ELECTRIC DISTRIBUTION LINES

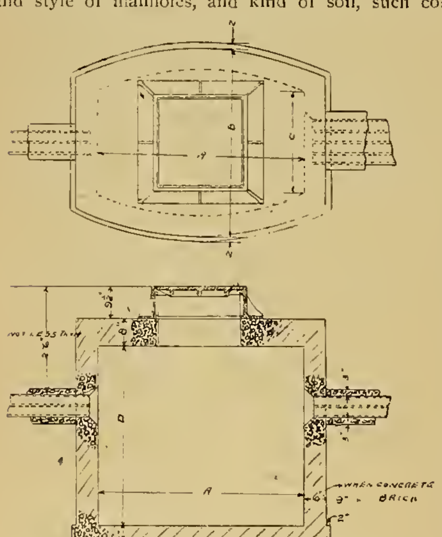
By Clarence Mayer

The value of data on the cost of building underground conduits is generally recognized by the large telephone and electric-light and power companies, but is usually regarded with indifference by small companies. Even with the larger companies data are often collected in such a manner

FIG. 1. DIGGING TRENCH FOR CONDUIT

that they are of no value as a basis for estimating the cost of future work.

Usually the cost records are a collection of work reports and bills for materials, and the best of these work reports give only the number of hours worked by each man and the total work accomplished. No details of the number of hours worked on laying ducts, mixing concrete, excavating and other subdivisions of the work are given, and, consequently, all that may be gleaned from such work reports is the cost of a day's work composed perhaps of trench and manhole excavating, tile laying, concrete mixing and so on. Naturally as no two conduits are alike in cross-section, length, number and style of manholes, and kind of soil, such cost



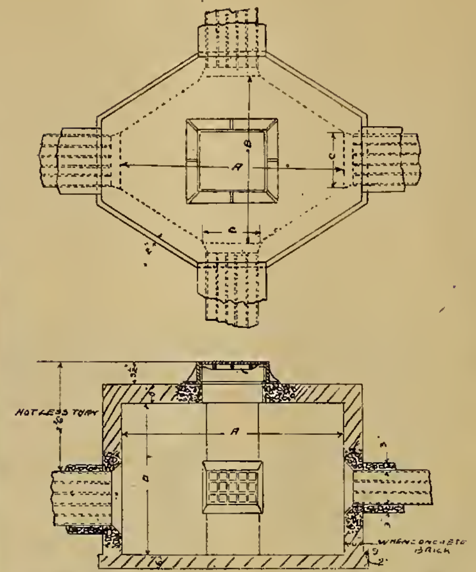
Dimensions: A, 4 feet 6 inches; B, 3 feet 6 inches; C, 2 feet 6 inches; D, 4 feet 6 inches

FIG. 2. MANHOLE FOR NON-INTERSECTING CONDUIT RUN

records cannot be used as a basis for future estimates.

When we consider that on large jobs one man can keep an accurate record of time spent on each subdivision of work, and on small jobs it may be done by a timekeeper in connection with his other work, it seems strange that any company should be so shortsighted as to neglect the collection of accurate cost records, especially as it is the teaching of experience that accurate estimates tend to reduce construction cost, and it is only through cost records that a check may be kept on the cost of construction.

Underground construction is a matter that is



Dimensions: A, 4 feet 6 inches; B, 4 feet 6 inches; C, 1 foot 6 inches; D, 4 feet 6 inches

FIG. 3. MANHOLE FOR INTERSECTING CONDUIT RUNS

becoming of more importance every year, especially with companies operating in suburban districts. The constant agitation against overhead wires in the cities has drawn the attention of suburban towns and villages to the matter, and has often resulted in the passage of ordinances requiring wires to be placed underground in portions, if not all, of such towns and villages.

It is a difficult matter, of course, to convince

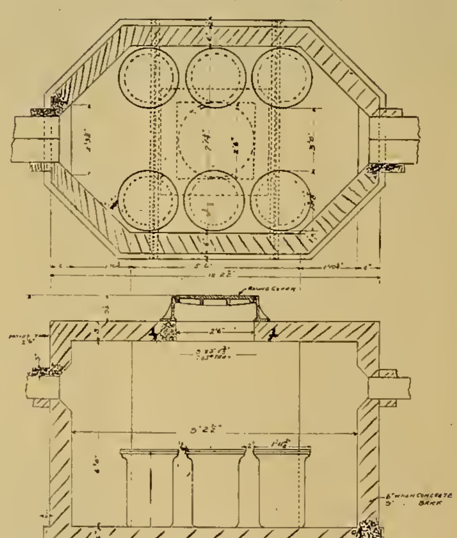


FIG. 4. MANHOLE FOR PUPIN LOAD POTS OR TRANSFORMERS

the citizens of these small towns that conditions are entirely different in the country from those in the city, and that the expense of underground construction is only justified where the business is concentrated. Suburban companies are frequently obliged, therefore, from motives of public policy, to do a certain amount of underground work.

In situations of this kind a knowledge of methods and costs is imperative if a company wishes to avoid the adoption of poor and cheap underground construction, or expensive construction not justified by the company's capital or by the volume of business.

In this article are given the method and cost of installing 42,645 lineal feet of multiple-duct conduit in a suburban district near Chicago, together with 99 manholes. All the conditions of the work and kind of soil are explained, and rates of wages, quantities and cost of material and costs for each subdivision of construction are itemized, so that

FIG. 5. BUILDING A BRICK MANHOLE

these data may be of practical value for basing estimates.

The work was done in the fall of 1907, and the following daily wages were paid:

Foreman	$4.00
Assistant foreman	3.00
Timekeeper	2.50
Watchman	2.00
Water boy	1.00
Laborers	2.00
Teams (including driver)	5.50

Overtime was paid for at regular rates.

Vitrified-clay tile was used in constructing conduits. The trench for vitrified-clay tile was excavated to such a depth as to leave between the top of the concrete over the tile and the grade of the street a distance of not less than two feet.

The width of trench was six inches more than the width of the tile. Fig. 1 shows the trenching in progress. In laying the tile a concrete foundation of three inches was first placed and tamped. On this the tile were laid and centered by means of dowel pins, and tile joints were covered on the sides and top with burlap, cut six inches wide, and plastered with cement mortar mixed in proportions of 1:2. The tile was then enclosed in three inches of concrete and the trench refilled.

The excavations for manholes were of such depth as to bring the bottom of a concrete roof 17½ inches below street grade. In size, the excavations were of approximately the dimensions shown in Figs. 2, 3 and 4. Manholes were either of brick with concrete floor, concrete roof and cast-iron frame and cover, or of concrete throughout, with cast-iron frame and cover. The thickness of walls for brick manholes was nine inches and for concrete manholes six inches. Floors were six inches in thickness and roofs eight inches.

In constructing a manhole the concrete floor

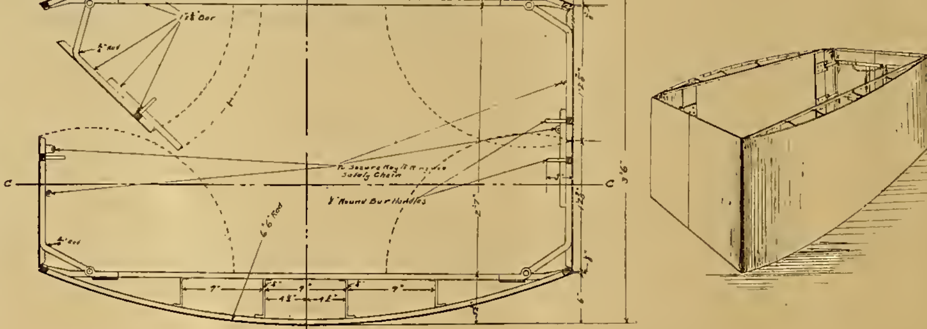


FIG. 6. COLLAPSIBLE IRON MANHOLE FORM

was first laid and tamped. In the case of a brick manhole the wall was then built and the form for concrete roof placed. The roof was then concreted and the iron frame placed while the concrete was still wet. A brick manhole in the course of construction is shown by Fig. 5.

The wall of a concrete manhole was constructed by using the form shown in Fig. 6. This form was set up in the excavation and concrete was placed and tamped between the earth wall of the excavation and the form. The concrete roof was then placed. The form used in constructing a roof is clearly shown by Fig. 7. It is composed of separate boards placed loosely together and cut

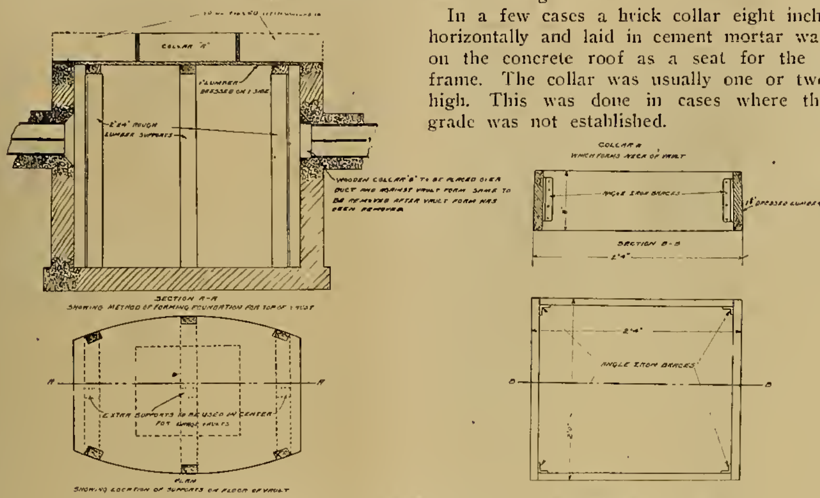


FIG. 7. FORMS USED IN CONSTRUCTING A MANHOLE ROOF

to length and shape of manhole. This form is placed inside of the manhole with the top of the boards on a level with the top of the wall, as shown by Fig. 8, and is supported by uprights. On this form is placed a bottomless box for forming the manhole opening and the concrete is then placed. A completed manhole roof, with cast-iron frame in place, is shown by Fig. 9. On completion of the manhole the roof form is taken apart and removed through the manhole opening.

The collapsible steel form used in building concrete manholes, Fig. 6, is made in two parts, each part forming one side wall and one-half of each end wall. The end pieces of one of the two parts are fitted with overlapping steel bands, which are fastened as shown on the drawing, and hold the forms rigid. The end pieces are hinged well back on the side pieces, so that they swing inward immediately and do not scrape or catch against the concrete in removing the forms. Two of these forms are used in building a manhole to the height shown in Fig. 2.

In a few cases a brick collar eight inches wide horizontally and laid in cement mortar was placed on the concrete roof as a seat for the manhole frame. The collar was usually one or two bricks high. This was done in cases where the street grade was not established.

Concrete was mixed by machine in the following proportions:

For conduit and floors of manhole: One part American Portland cement, four parts sand and eight parts of ¾-inch stone.

For sides and roofs of manholes: One part American Portland cement, three parts sand and five parts of ¾-inch stone.

FIG. 8. FORM FOR CONCRETE TOP OF MANHOLE IN PLACE

IV., are based on records kept on the work by a cost man, especially assigned to this work. Material cost given in these tables includes all wastes occasioned by breakage, spoiling of cement by rain, and other causes incident to all large jobs. "Supervision" includes cost of foreman, assistant foreman, timekeeper, material clerk, watchman and water boy.

Table II. gives the detail cost per manhole of labor and material used in manhole construction, and Table III. gives the detail cost per lineal foot of material used in conduit construction. The cost of material given in these tables is based on the prices given in Table IV. The price of sand and stone was high on account of the length of the haul.

About 2,200 feet of conduit was installed in low, swampy ground. About 1,000 feet was installed in wet clay, and the balance was installed in clay soil. On account of the small proportion of soil other than clay, no separation is made in these data of the conduit and manholes built in the different kinds of soil, as it would make very little actual difference in the cost per lineal foot.

Approximately four miles of the conduit was installed in macadamized streets, and the balance was installed in unpaved streets. A week of wet weather made hauling on unpaved streets difficult and added to the cost of the work.

TABLE I.—AVERAGE COST PER LINEAL FOOT OF THE COMPLETED WORK

Conduit Cross Section.	No. of Lin. Trench Ft.	No. of Duct Ft. Laid.	Detail Cost of Installing Conduit. Teaming.	Excavating.	Mixing and Dumping Concrete.	Laying Tile and Placing Concrete.	Back Filling.	Supervision.	Total Labor Cost.	Manholes. No. of Manholes Built. Fig 2	Fig. 3	Fig. 4	Labor Cost.	Transporting Material. Unloading and Dist. Material.	Freight.	Misc. Costs. Labor Cost of Repaving.	Gen. Superintendence.	Cost of all Material.	Total Cost per Line Ft.
2 Duct	1,126	2,252	$0.0302	$0.0725	$0.0370	$0.0162	$0.0411	$0.0371	$0.2341	......	2	......	$0.0484	$0.0098	$0.0131	$0.0162	$0.0047	$0.2611	$0.5874
3 Duct	3,400	10,200	0.0312	0.0801	0.0420	0.0171	0.0361	0.0438	0.2503	3	3	......	0.0378	0.0092	0.0155	0.0172	0.0051	0.3550	0.6601
4 Duct	8,270	33,080	0.3030	0.1220	0.0431	0.0302	0.0531	0.0502	0.3316	14	6	1	0.0554	0.0150	0.0239	0.0181	0.0070	0.3759	0.8269
6 Duct	29,849	179,094	0.0422	0.1403	0.0544	0.0341	0.0712	0.0631	0.4053	30	38	3	0.0587	0.0176	0.0259	0.0154	0.0082	0.4791	1.0102
All Cross Sections	42,645	224,626	$0.0392	$0.1301	$0.0508	$0.0315	$0.0641	$0.0584	$0.3742	47	49	4	$0.0561	$0.0162	$0.0244	$0.0161	$0.0076	$0.4410	$0.9356

TABLE II.—AVERAGE LABOR AND MATERIAL COST PER MANHOLE

Style of Manhole.	No. of Manholes Built	Labor Cost. Teaming.	Excavating.	Placing Floor.	Laying Brick.	Placing Sides.	Placing Roof Frame and Filling In.	Supervision.	Total Labor.	Material Cost. Concrete.	Cement Mortar.	Bricks.	Iron Frame and Cover	Sewer Tile, P-traps and Drain Plate	Total Material.	Total Cost per Manhole.
Fig. 2	47	$2.01	$4.62	$0.87	......	$3.01	$2.97	$2.14	$15.62	$5.91	......	......	$11.75	$0.38	$18.04	$33.66
Fig. 3	49	2.43	4.49	0.92	$12.72	......	3.11	3.56	27.23	3.93	$4.49	$7.52	11.75	0.27	27.96	55.19
Fig. 4	4	7.31	18.68	4.07	28.53	......	8.74	8.91	76.24	8.22	9.36	16.00	16.53	0.42	50.53	126.77

TABLE III.—DETAIL COST PER LINEAL FOOT OF MATERIAL FOR CONDUIT CONSTRUCTION

Conduit Cross Section.	Cost of Concrete.	Cost of Tile.	Cost of Burlap.	Cost of Dowel Pins	Cost of Lumber.	Cost of Screenings and Stone for Repaving Mac. Road.	Cost of Wooden Plugs.	Total Material Cost per Lin. Foot.
2 Duct	$0.1166	$0.0792	$0.0049	$0.0017	$0.0013	$0.0074	$0.0003	$0.2114
3 Duct	0.1452	0.1188	0.0057	0.0033	0.0028	0.0082	0.0004	0.2844
4 Duct	0.1456	0.1584	0.0043	0.0011	0.0011	0.0081	0.0004	0.3190
6 Duct	0.1676	0.2376	0.0048	0.0022	0.0014	0.0063	0.0004	0.4203

TABLE IV.—MATERIAL PRICES

Cement	$ 1.65 per barrel
Sand	1.90 per yard delivered on the work
Stone	1.90 per yard delivered on the work
Screenings	1.50 per yard delivered on the work
Vitrified clay tile	0.0396 per duct-ft., F. O. B. Chicago
Six-inch sewer tile	0.09 per foot delivered on the work
Six-inch "P" traps	1.38 each delivered on the work
Drain plates	0.22 each
Wood plugs	0.03 each
Burlap six-inch wide	0.014 per yard
Dowel pins	3.25 per M
Brick	8.00 per M delivered on the work
Lumber	22.00 per M foot
Cast iron frames and covers— Square	11.75 each
Cast iron frames and covers— Round	16.53 each

The average cost, per lineal foot, of the entire work is given in Table I. The cost of unloading and distributing, as given in this table, includes the cost of teaming and labor in hauling and handling tile, cement, burlap, dowel pins, and manhole frames and covers, all other material being purchased delivered at the job. By "cost of general superintendence" is meant the cost of time, meals, carfare and livery, used by the construction superintendent and his assistants in supervising the work. This table, as well as Tables II., III. and

FIG. 9. CONCRETE ROOF OF MANHOLE WITH IRON FRAME FOR COVER

By an agreement executed at Chicago between the Chicago, Rock Island and Pacific Railroad and the Rock Island Southern Interurban Railway the construction of the latter road, between Davenport, Iowa, and Galesburg and Monmouth, Ill., is assured. The work of electrifying the Rock Island lines involved is to start at once and the work will be pushed until completed.

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street); Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

PENNSYLVANIA is the first state in which an electrical association has decided to become a state branch or "geographic section" of the National Electric Light Association in accordance with the Doherty plan of organization of the national body as adopted at the Chicago convention of last May. A report of the convention of the Pennsylvania Electric Association, held last week, at which this action was taken, is given in this issue of the Western Electrician. President Eglin of the National Electric Light Association, who is connected with the leading central-station company of the state, was present, and seemingly made such a convincing argument for the change that it was voted unanimously that the association should be reorganized as a state branch of the national association.

This action is of great interest; but to what extent it will be considered a precedent for other states remains to be seen. The matter was not brought up, officially at least, at the recent conventions in Michigan and Ohio, although both were held since the Chicago convention, and if it had it is doubtful whether these state organizations would have voted to merge their identity in the national association. There are also flourishing state electrical associations in Iowa, Illinois, Colorado, Kansas, Minnesota, Nebraska and other states, and it is probable that considerable missionary effort will be needed to convince them that it will be wise to disband and apply for membership in the national organization. Many company and individual members belong to both state and national associations, but the state societies have also many members that do not belong to the larger body, and vice versa. Then, too, it is not to be doubted that there are numerous members of the state organizations that would give up their national membership if forced to choose between the two.

Strong arguments can be adduced in favor of the state-branch idea, but there are also reasons why a purely state organization will be more popular and useful at home and among home folks and home lawmakers. The question is one not to be lightly decided, and should be carefully thought out in all its bearings. Mr. Doherty's idea that "the National Electric Light Association should be the basis for a complete organization of the entire business of the country" is bold and attractive; but it has also its dangers and drawbacks, which must be carefully considered.

IN THE STRUGGLE which seems to be impending for the electrification of the Illinois Central Railroad in Chicago the forces that contend for a cleaner and quieter city are marshaling with alacrity and enthusiasm. Both men and women on the South Side are organizing associations to combat the soft-coal-burning steam-locomotive nuisance, and the daily press is lending its powerful aid. One society of clubwomen has already obtained 6,000 signatures to a petition to the City Council to compel the Illinois Central to abolish smoke. This number, obtained by volunteer canvassers, may be multiplied many times, and with ease, before the campaign is over. The men are arranging to raise money and devising a plan of concerted action between the numerous bodies in Kenwood, Hyde Park, Woodlawn and other communities which are anxious to bring about this greatly desired reform. In all directions there is shown real earnestness and resolute determination. It is an uprising against smoke and soot and cinders and nerve-racking noise, by the substitution of electric power for steam locomotives within the city limits, and is in no sense an attack on a corporation or a railroad as such.

In the petition which is being circulated it is declared that "the manner in which said railroad operates its trains and engines along its right-of-way, causing the district in which we reside to be inundated with dirt, smoke and cinders, and the day and night to be made hideous with the noise of escaping steam through starting and stopping its engines, constitutes an unbearable public nuisance," which should be abated. Furthermore, "the matter of the electrification of the road has been suggested and thoroughly canvassed, and should now be ordered."

Apparently the Illinois Central will wait until forced to act. This is regrettable, and it is still to be hoped that the company will not wait until the tide of public sentiment reaches an overwhelming flood. But if force must be used, there are methods which can be applied. The recent application of the company for permission to cross 15 streets in the extreme southern end of the city for its proposed new line to Gary, Ind., indicates one weapon in the hands of the City Council. Once public opinion is thoroughly aroused, there can be no question that the company will be compelled to accede to the demand. It seems to be the part of wisdom for the Illinois Central to yield gracefully, and that speedily.

ELECTRIC HEATING and cooking devices offer such a desirable day load for central stations that any practical suggestions that will help the plant manager to increase this class of business are welcome. Mr. H. A. Mott of Jackson, Mich., prepared a paper for the recent convention of the Michigan Electric Association in which were given some valuable hints of this description worthy of attention. He gave the results of experiences in an eastern city where it was arranged to give a rate of five cents per kilowatt-hour to all persons who wired up separately for a complete kitchen outfit or luminous radiator. For these customers a separate meter was placed, with a minimum rate of $1 a month. The company gave a three-week demonstration in a large department store. After it was over, this demonstration appeared to have been a failure, although visited by over 20,000 people. The company had not sold more than half a dozen pieces of apparatus, but at the end of the season it was found that the plan had been excellent advertising.

After the people were given an idea of the uses of electric household apparatus it was decided to make a house-to-house canvass with the electric flatiron. For this purpose three boys and a wagon were employed, the wagon bearing large signs stating that the company would put out electric flatirons on free trial for three weeks. As there was some doubt as to the number of irons the company could put out and keep out, it was decided to place an iron only in every other house or apartment. The boys were given cards which were signed by each person taking an iron, and these cards were turned in each day and filed under the date when they would come due. In this way the wagon was able to put out 25 irons a day. At the end of the three weeks it was found that on some days 10 would come back, on other days none. The results showed that on an average over 20 irons of the daily output were kept. In addition, many people who had returned the devices at the end of the three weeks came in afterward and bought others.

The delivery in every other house proved to be an excellent expedient. It served to arouse the interest of the people to the fact that they had been slighted while their neighbors had been favored. The number of telephone calls and visits from indignant housewives at the central station was surprising. The complainant wanted to know why Mrs. A was favored and she was not; she guessed she used as much current as the other woman did and paid her bills just as promptly. The manager promised to send an iron up at once by the office boy. One boy was kept at this work all the time; it was a trifle more expensive than if the company had delivered the appliance at first by the wagon, as the boy could only carry three or four of them at a time, but with very few exceptions irons taken out this way remained out.

At the same time the company kept up its newspaper advertising and pushed the use of sewing-machine motors and electric cooking devices. At the end of the summer there were installed 800 electric flatirons, nine complete cooking outfits, 20 percolators, 13 luminous radiators, 30 sewing-machine motors and 35 chafing dishes, besides a considerable number of hot-water heaters and cigar lighters. It was found that the income amounted to $6 a year for each flatiron, $48 a year for each kitchen outfit, $12 a year for each luminous radiator, and $1 a year for each percolator and sewing-machine motor. Chafing dishes, hot-water heaters and cigar lighters were not taken into account. The smaller articles do not bring an income directly to the central station, but are one of the best advertisements for the larger articles, from which an income can be derived.

MOTOR MANUFACTURERS' ASSOCIATION

The American Association of Electric Motor Manufacturers held its first meeting for the presentation of papers and discussions on September 9th, 10th and 11th, at the Thousand Islands, St. Lawrence River, N. Y. The association was formed by the representatives of 25 motor manufacturers, at Hot Springs, Va., several months ago, and has for its purpose the standardization of motor equipment and the promotion of the industry in every lawful way.

The meeting of last week was well attended and several excellent papers on motor subjects were presented. The titles of these papers and the names of their authors are as follows:

"Ratings and Guarantees of Direct-current Motors," W. T. Hensley, Westinghouse Electric and Manufacturing Company, Pittsburg.

"Freight Traffic," W. B. Everest, Westinghouse Electric and Manufacturing Company, Pittsburg.

"Direct-current Motors for Elevator Service," W. J. Warder, Jr., Roth Bros., Chicago.

"Ratings and Guarantees on Alternating-current Motors," C. S. Reno, Triumph Electric Company, Cincinnati.

The standardization of motors was discussed and the general routine business incident to the starting of the association was transacted at this meeting.

Many opportunities were offered the visiting delegates for entertainment and prizes were given to the most successful fisherman, the best golfer and the best bowler. A dinner to the members of the association and their guests was attended by about 30 members and as many visitors.

The officers of the association remain the same as elected at the first meeting and published in the Western Electrician of August 8th, with the exception of the appointment of a permanent secretary, Mr. W. H. Tapley, who will have his office at the association's headquarters in the Engineers' Building, New York city.

ELECTRIC CLUB MEETINGS

In conformity with the recently announced plan of interesting the Electric Club of Chicago in civic electrical matters a number of meetings in September have been and are to be devoted to discussions of such topics. On September 9th Mr. Ray, contract agent of the Sanitary District, addressed the club on the "Distribution of Current from the Lockport Station of the Sanitary District." Mr. William Carroll, city electrician of Chicago, spoke on "Street Lighting, Past, Present and Future" at the meeting of September 16th. At the next meeting (September 23d) Mr. F. A. Sager of The Arnold Company will talk on "The Electrification of Steam Railroads." On September 30th Prof. C. E. Freeman will make an address on "Power and Irrigation Developments in the West."

Although the October program has not yet been completely drawn up, the meeting on October 21st will be devoted to a talk, illustrated by lantern slides, by Mr. W. T. Dean, of the power and mining department of the General Electric Company, on "The Application of Electric Power in Steel Mills." As showing the increased interest taken in the broadened range of discussion, the attendance at the recent meetings has been exceptionally large. These meetings are held on Wednesdays and follow directly after the weekly luncheon in the Grill Room of the Automobile Club.

BRITISH ASSOCIATION

London, September 5.—The British Association for the Advancement of Science is in session in Dublin, but of a purely electrical character there is not a great deal to be recorded. The president, Mr. Francis Darwin, a descendant of the great Darwin, devoted himself to evolution, largely in relation to plants, while the presidential address to the Engineering Section, by Mr. Dugald Clerk, traced the early work in connection with prime movers, and emphasized the importance and future of internal-combustion engines, without putting forward any new theories or, for that matter, facts, either.

The remainder of the papers have only remote interest to electrical engineers. It should be mentioned that Prof. J. J. Thomson, F. R. S., the great physicist of Cambridge, has been chosen as the president of the meeting which will be held in Winnipeg next year. The meeting this year has proved, socially, a greater success, probably, than some of its predecessors.

PENNSYLVANIA ASSOCIATION BECOMES A BRANCH OF N. E. L. A.

The Pennsylvania Electric Association held its annual convention at Eagles Mere on September 8th and 9th. Forty companies were represented, including most of the principal electric-lighting companies in the state, and at the time the convention was called to order there were about 100 delegates and guests present.

PENNSYLVANIA ELECTRIC CONVENTION AT EAGLES MERE LAST WEEK

After the reports of the officers and the address of the president were presented, the association discussed the advisability of reorganizing on the basis of a state branch of the National Electric Light Association. The discussion was opened by William C. L. Eglin of Philadelphia, president of the National Electric Light Association, who outlined the scope of the national association's work and its provisions for the organization of state and territorial branches. The subject was discussed very thoroughly by the members present and practically all of the features of association work were treated. The unanimous opinion was expressed that there were no disadvantages in a state association's becoming a state branch of the National Electric Light Association, and that the advantages to be gained were along all of the lines of association work. Accordingly, later, when the question was voted upon, the motion was unanimously carried that the state association should reorganize as a state branch of the National Electric Light Association, and a committee was appointed to carry out the details.

As a result of the election of officers for the coming year, L. H. Conklin, Connellsville, was chosen president; E. F. McCabe, Lewistown, vice-president, and E. L. Smith, Towanda, secretary and treasurer.

The meetings were well attended. The paper on "The Day of Distribution," presented by T. Commerford Martin of New York, Tuesday evening, was well received and opened up an interesting line of discussion, particularly on overhead line distribution. A committee was appointed to prepare specifications and instructions regarding proper construction, and to give particular attention to foreign attachments and railroad crossings.

F. W. Willcox of Harrison, N. J., read an interesting paper on incandescent lamps, which brought out many points on this subject. The rest of the sessions of Tuesday evening and Wednesday were given over to the discussion of topics of importance and interest to the members of the association. Some of these subjects treated Tuesday evening were: The attitude of the association toward state legislation; the advisability of a state commission; taxation, local and state; capitalization of lighting companies.

On Wednesday morning the convention took up the matters of the fallacies of limited franchises, public liability, local municipal control of the industry, and a uniform system of accounting. The afternoon session was closed with a number of practical questions propounded and answered by the members of the convention.

The program as arranged embraced most of the questions of importance at this time, and all of the subjects were freely discussed. The opinion was universally expressed that state conventions are beneficial to the companies and fill a field that cannot properly be covered in any other way. The discussion was marked by enthusiastic earnestness, which indicates a most satisfactory career for the work of this branch of the association. Everyone was well pleased with the amount of work accomplished and the great advantages of the association to the industry in the future.

A complete program of amusements and entertainment was provided for the lady guests accompanying the members. One of the enjoyable features in which all took part was a corn roast and camp fire on the shore of the lake. An impromptu "glee club" rendered college songs and a generally pleasant evening was spent, the success of which was largely due to the courteous and affable entertainment committee which made everyone feel very much at home. All of the members appreciated the kindnesses of the committee and the pleasant hospitality that was shown to the ladies by Mrs. Conklin, who was untiring in her efforts for their comfort and pleasure.

The work of this state branch will undoubtedly be followed with much interest, as many new questions will have to be solved by it, and its experience will be valuable to all other state branches. Its example will undoubtedly be followed by others, and each will receive mutual benefit. A number of members remained over for a day or two after the convention for opportunity to talk over their own special conditions.

The convention program was in charge of a committee composed of Ernest H. Davis of Williamsport, James E. Pyle of West Chester and W. W. McCleary of Pittsburg, Pa.

ILLINOIS CONVENTION TO BE HELD IN BLOOMINGTON NEXT MONTH

Arrangements have been made to hold this year's convention of the Illinois State Electric Association at the Illinois Hotel in Bloomington, on October 27th and 28th. Several papers will be read by members of the association. H. E. Chubbuck of Ottawa is secretary of the association.

TELEPHONE EARNINGS

Net earnings for July of the associated Bell telephone operating companies, exclusive of the American Telephone and Telegraph Company's long-distance lines were \$2,839,200, compared with \$2,241,200 for July, 1907. For seven months to July 31st the comparative net earnings were as follows: 1908, \$18,241,900; 1907, \$16,560,800.

THE WRIGHT AEROPLANE AND WIRELESS COMMUNICATION

By Frank L. Perry

Part II.

Opinions of Army Officers in Relation to "Wireless" Possibilities

Brigadier-general James Allen, signal officer of the United States Army, was interviewed before the flight and requested to give his opinion as to what might be the possibilities of the use of the aeroplane in the service when operated as a base for wireless telegraphy and telephony.

General Allen was most courteous, but said that at the present time he would much prefer to wait and see the result of the Fort Myer tests. From his conversation one can easily see that General Allen is taking a very broad-minded stand in regard to aeronautics, and has a full appreciation of its possibilities. Further, it is not at all hard to discern from his manner and conversation that it is his intention to continue to urge the government to pay more and more attention along this line of scientific investigation, and it is understood that every inventor, whether along the line of aeroplane or dirigible work, is to be given every facility and a fair chance to succeed, and thus to aid the department in its aeronautical ventures. General Allen further remarked that Mr. Orville Wright had been told to take all the time and spare no pains whatever to bring his work to a successful conclusion. The general deems the gas motor one of the greatest factors in aeronautics and hopes for, and indeed looks for, much improvement in this direction.

Major George O. Squier, U. S. A., one of the most courteous of those in attendance, was particularly enthusiastic, too, both in his manner and talk relative to the splendid performance of the aeroplane during the flight of September 3d. Major Squier is an authority on signal-service electrical matters, and is well known through his scientific work, particularly in the electrical line.

"It is splendid! Superb!" said Major Squier within a few moments after Mr. Wright made his flight of Friday; and he seemed to think he had covered the entire ground. His manner certainly was one of elation. "Wireless telegraph?" continued Major Squier. "Of course, we will try all sorts of experiments with it in connection with the aeroplane," and he looked as though he meant everything he said. Those who know Major Squier best are free to state that there is little doubt but there will be no falling off in his enthusiasm in this direction, as wireless telegraphy is one of his hobbies.

Lieut. F. P. Lahm is well known through his prominence in the first great international balloon contest from Paris, France, in which he won the contest, traveling in all about 400 miles, and also from his participation in the great St. Louis race. He was approached at the Wright aeroplane tests for an opinion as to the future for wireless telegraphy and telephony from an aeroplane. Lieutenant Lahm was very conservative, and at first declined to venture an opinion on the ground that he did not claim to be a wireless expert.

"You know," said he, "that I am an aeronaut rather than an electrical man. But I will say that as you are doubtless already aware, I piloted the balloon from which, at a comparatively recent date, Major Russell and Captain Wallace conducted very interesting wireless-transmision tests. During that experiment we received wireless messages at our balloon from a distance of about 20 miles with the greatest ease. But as yet we have not made any experiments in sending from a free balloon or a dirigible, for we were a bit fearful of possible though not probable bad effects—accidents from balloon gas ignition. However, we really do not much fear this. We are merely, I think, properly cautious. I feel sure now that in the near future we will, first with the dirigible as a base, try for wireless transmission from the airship to ground. Then, after tests from the dirigible, it will be time enough to give some consideration to a possible use of the aeroplane for this purpose.

"In our recent balloon experiment with wireless we employed a 300-foot antenna, which hung down from our car. Of course, with a dirigible the conditions were practically the same as far as the antenna is concerned. In the case of the aeroplane it would be very easy to make a test with the wire framework and bracings of the aeroplane structure for the upper antenna and a 300 or 400-foot hanging wire for the lower or groundward antenna. But," and here Lieutenant Lahm, who is an officer of quiet manner and not a little reserve, smiled and a bit abruptly concluded—"But, do you not think we should get more facts on aeroplanes before we do much speculating?"

Lieut. B. D. Foulois of the United States Army Signal Corps, now stationed at Washington, D. C., was interviewed as to the possible and probable operation of the aeroplane as a base for wireless telegraphic and telephonic communication. Lieutenant Foulois was for some time at Fort Leavenworth in active service testing and experimenting with wireless outfits of all sorts for army service on horse and mule back. Lieutenant Foulois has made a number of ascensions, too, in the Baldwin dirigible airship during the Fort Myer tests. He said:

"Yes; without a doubt all we Signal Corps officers are deeply interested in the success of the aeroplane, and I for one am enthusiastic in my firm belief, based on the now apparently authentic reports of Wilbur Wright's great success in France, that the aeroplane Mr. Orville Wright is now experimenting with here at Fort Myer will prove a most excellent base for wireless electrical communication. We Signal Corps men are eager to get hold of it, of course.

"It seems at first glance as though it will be a comparatively easy matter to equip Mr. Wright's aeroplane with both a sending and receiving wireless apparatus. From our tests at Fort Leavenworth with pack sets on mules for transportation of a wireless outfit, we found that about 200 pounds was, roughly, all we had to carry, exclusive of antenna and poles. Mr. Wright, you know, is absolutely confident of his ability to carry such an additional weight."

"Would you use a dynamo or a storage battery as your source of electrical energy?"

"Well, remember we have given but little thought as yet to details, but if today I were to be ordered to start experiments I should without hesitation equip first with a storage-battery set.

"What detector? One of the silicon type, I think, rather than one with any liquid in it. We have had good success at Fort Leavenworth with the silicon detector. One great question, however, which will have first to be solved is whether cutting loose entirely from a ground connection will shorten or interfere entirely with our sending of messages. You know that, already, we have received all right in a free balloon."

What the Air Navigators Think

In conversation relative to the possibilities of wireless telephony from the aeroplane, Mr. Orville Wright did not seem to think there would be any trouble carrying a source of power, such as a dynamo or storage battery. But he felt in the case of the wireless telephone, as at present operated, such exceedingly delicate apparatus could hardly be expected to operate with any degree of success with so noisy a gasoline engine. It was pointed out to him that, of course, this might be muffled, but it could be seen that he was not very enthusiastic about wireless-telephonic prospects. With the present apparatus he, of course, admitted the feasibility of receiving and sending telegraphically, if it were found to be desirable, but he was conservative enough to say plainly that he felt the dirigible balloon would be the proper base for the first experiments along this line.

C. W. Furnas, one of Mr. Orville Wright's two trusted mechanical assistants at Washington, holds the distinction of being the first man, outside the two Wrights, to make a trip in the air on the aeroplane. Mr. Furnas made his flight first with Mr. Wilbur Wright and also on the same day he made another flight with Mr. Orville Wright. Both flights were at Kitty Hawk, N. C., and took place earlier on the same day, May 14, 1908, when Wilbur Wright had the fall that so badly damaged the machine, and very nearly resulted seriously for the operator.

"Yes," said Mr. Furnas; "I made the trip all right, and it was novel in one way, but not in another; it was just the same sensation you have whenever you go over the 'hills' and down in the 'valleys' on a roller coaster. Exciting? I should say it was, especially when from the wind at the side or other cause the aeroplane goes sideways. What I most feared, secretly, was that the machine would commence 'well digging,' even if it did not shoot or dart down sidewise to the ground.

"What is 'well digging?' O, that's the name the Wrights gave to the aeroplane's action when it started, in their early experiments, to spin round and round, one wing pointed on a downward slant to a center, making a sort of contracting spiral on this center, until the aeroplane turning around finally strikes the ground on the wing tip or end. It's not a nice thing to get mixed up in, I can tell you, and it was one of the great difficulties the Wrights have most beautifuly overcome.

"Wireless telegraphy and the aeroplane? As a mechanical man, mind you, with no claim as an electrical wireless expert, it seems as though it would be mighty easy if you wish to do it, to carry even a small dynamo, having, of course, seen that your aeroplane engine is one with surplus power enough to drive your dynamo. But I cannot help thinking that experiments of this sort should first be made from the dirigible balloon, like Baldwin's, and with this experience, then tackle it in connection with an aeroplane."

A Possible Line of Experimentation

Summarizing, it is not difficult to imagine the direction along which the first wireless experiments may be made.

The general impression seems, therefore, to be that two plans could be used with the Wright aeroplane. One of these methods is indicated diagrammatically in Fig. 6, while the other is shown in Fig. 7.

It should be borne in mind that these diagrams are of a purely speculative nature, suggested by the interviews. But they are of interest in view of the now certain success of the Wright aeroplane.

Fig. 6

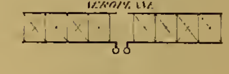


Fig. 7

SUGGESTED METHODS OF UTILIZING AEROPLANE FOR "WIRELESS"

Fig. 6 would indicate that one way of experimenting with wireless telegraphy would be to make the aeroplane itself the upper antenna, while a wire, say, 300, or so, feet long was dropped down from the machine to constitute the lower antenna. Fig. 7 shows the machine electrically broken, so to speak, into two metallic "boxes" or frameworks, so that the aeroplane would be a horizontal Hertzian oscillator.

Lieutenant Foulois thought well of both these methods of constructing wireless-telegraph antenna, on the plans, first, of a sort of perpendicular-winged Hertzian oscillator, as in Fig. 6, or with the horizontal equal-winged oscillator, as in Fig. 7. Both of these, he thought, would at first, very likely, be experimented with.

Operating the Aeroplane

Questioned as to methods of starting his aeroplane, Mr. Wright said that after various experiments and a number of more or less serious small disasters in trial flights with wheels beneath the machine, etc., he had come to the conclusion that, especially for army and similar work, the most practical and by far the most desirable method of starting his aeroplane was that employed at Fort Myer.

Relative to the operation of the two main planes of the aeroplane, Mr. Wright said that, roughly speaking, the change of angle which it was necessary to make in these planes was only about from 1 to 12 or 14 degrees. As to the speed of the machine, Mr. Wright feels that there will be no trouble with 40 miles an hour. He pointed out that it was not such a great "trick" after all to build an aeroplane to go at much greater speed. But he compared a machine of such construction to a racing automobile in contradistinction to one of a more substantial and therefore safer type. The best speed to date has been about 40 miles an hour. But he remarked that high speed would, as in racing automobiles and riding bicycles, involve considerable more nervous strain. While with the aeroplane under ordinary circumstances when soaring aloft, the nervous strain was really very little.

When asked relative to his most dangerous predicament, he laughed and said that it came one time when he was soaring at a considerable height, and suddenly found that for some cause or other his machine was darting into the top of a big thorn tree. He said that by an exceedingly rapid and most fortunate movement of levers he was able to bring the aeroplane back into its normal position. But, he said, what he thought were his prospects at that time gave him quite a severe nervous shock. Relative to the maximum height

very desirous of carrying out, if the opportunity is presented, some experiments with the wireless telegraph from the Wright aeroplane when operated during a long flight. Mr. Crane was an indefatigable, voluntary, and skilled assistant to the aviator in his preparation for his daring flights.

It was most amusing to hear the various comments of the spectators during Mr. Wright's preparations for flight: "Already he is a man under great nervous tension." "The strain is telling on him." "The nervous tension is making lines in his face," etc., ad libitum.

The exact truth, however, is that Mr. Wright has proven himself a man of superb poise, and the only time when he could have been accused of exhibiting the slightest nervousness was after he had been compelled by circumstances to make the

The cross indicates Mr. Wright. The man in front of him, facing the camera, is his assistant, Mr. Taylor. The man with the straw hat is Lieutenant Lahm

FIG. 8. ORVILLE WRIGHT ADJUSTING AEROPLANE

at which the aeroplane had been driven, he stated that as yet 95 to 100 feet was about the maximum.

Mr. Wright declared that there would be little or no difficulty in proceeding if in war the aeroplane should be perforated by a projectile; even if it made a hole as much as six inches in diameter, it could still, he thought, fly successfully.

There was not a little discussion among the experts as to the possible use of not only aeroplanes for wireless communication, but as a means whereby explosives might be dropped into a camp, or particularly on top of the ordinary warship, which the experts pronounced to be very nearly defenseless when considered from a point on a perpendicular line above them.

General Construction

On his arrival at Fort Myer, in the latter part of August, Mr. Wright was given the balloon house in which to store his aeroplane. This tall structure is a good half mile from the drill grounds at Fort Myer proper. It was while the aeroplane was housed in this building that the accompanying photograph was taken.

Referring to Fig. 8, just back of Mr. Wright, who stands in profile with his cap on, in the center of the picture, can be seen, by close inspection, a semicircular rudder embraced, in perpendicular position, between the two horizontal forward rudder planes. This little semicircular plane is parallel with the fore-and-aft center line of the aeroplane. It is practically stationary and is always kept in the position as shown in the picture.

Mr. Wright was accompanied from Dayton, Ohio, by his two skilled mechanical assistants, Messrs. C. E. Taylor and C. W. Furnas. A personal friend of Mr. Wright, Mr. S. C. Crane, also came to Washington to witness the flights, making the trip from Dayton in an automobile. Mr. Crane is a thoroughly practical gasoline-engine man, and is

sudden landing on September 3d, and broke his machine. On emerging from the intricacies of his aeroplane and the cloud of dust, he was met by a crowd of correspondents who literally shoved him about. Under this trying circumstance he appeared a little pale, and certainly was out of breath, but laughing and joking and not the least disturbed otherwise.

A point very much to Mr. Wright's credit relates to the fact that the aeroplane used at Fort Myer had never been flown before his flight on September 3d. A Washington paper came out with the statement that Mr. Orville Wright himself had not acted as aviator for three years. When questioned on this point Mr. Wright laughed and said that this was not correct, but that it was true that he had operated comparatively little. "But," said Mr. Wright, "this machine has never been in the air before."

[*To be continued.*]

[Since Mr. Perry's article was written Orville Wright has been making new records at Fort Myer with the aeroplane. On September 12th he made a flight lasting one hour 14 minutes and 24 seconds, rising to a height of 250 feet. The average speed was 38.75 miles an hour. On the same day he took up with him Major George O. Squier, U. S. A., of the Signal Service and made a two-man flight lasting nine minutes and six seconds. Both of these are record-breaking performances with heavier-than-air machines.—Ed. W. E.]

The City Council of Galena, Ill., has passed an ordinance requiring all wiring to be done in accordance with the national code and underwriters' rules. No firm or company supplying electric current is obliged to connect with any consumer's circuit unless the latter is wired according to the above regulations.

BECQUEREL AND MASCART

By A. de Courcy,

Paris correspondent of the Western Electrician

France has lost a number of its most eminent scientists within a short time, and the number is now increased by the death of two of its prominent workers. After the decease of Berthelot, Curie and Hospitalier, we now have to register the names of Becquerel and Mascart, whose death occurred almost at the same time.

The name of Henri Becquerel is intimately connected with phosphorescence and radio-active phenomena, and it was he who opened up the far-reaching field of research which led to the discovery of radium. Mr. Becquerel was recognized as one of the leading scientists of France, and he held a place which is accessible to but few, being a member of the Institute. He also occupied the position of permanent secretary of the Academy of Sciences, having been made a member of that body in 1889, and was at the same time professor at the Natural History Institution, otherwise known as the Jardin des Plantes, and at the Polytechnic College of Paris. He was officer of the Legion of Honor.

Becquerel was born in 1852 and was the son of Edmond Becquerel and grandson of Antoine Becquerel, both of whom were prominent scientists and members of the Institute. His death occurred at a comparatively early age, this being but 56 years. He had the rare merit, like Volta and Ampere, of being one of the scientists whose discoveries threw an entirely new light upon certain of the sciences and indeed upon the whole theory of matter, for it was he, in fact, who discovered the new and unexpected phenomena of radio-activity, having announced in December, 1896, that matter is capable of giving off spontaneous radiations. Uranium was the first metal in which this property was observed, and this opened up a new and most fruitful field of research, which other scientists entered with enthusiasm. One of the principal results was the discovery of radium by Curie, and the Academy of Sciences of Stockholm recompensed these brilliant discoveries in an exceptional manner by awarding the Nobel Prize conjointly to Becquerel and Mr. and Mrs. Curie in 1903.

Becquerel's work includes many lines of research, among which the most prominent are the transmission of light by crystals and the phenomena of phosphorescence. His recent course of lectures at the Jardins des Plantes, upon radio-activity, which the writer had occasion to follow, were attended with great interest.

The name of Mascart is intimately connected with electrical science. Eleuthere Elie Nicolas Mascart was born at Quarouble, France, in 1837, and was a brilliant pupil of the Normal College in 1858. He received the degree of doctor of science in 1864. At first professor at the High School of Versailles, then at the Chaptal College, he entered the College de France at Paris a few years after as professor, succeeding the celebrated physicist Regnault in 1872, after having been his assistant for some years. The science of meteorology, which was at that time in its first stages of development and commenced to take form after the work of Le Verrier, specially attracted the attention of Mascart. He devoted a large amount of attention to this science, down to the time of his death. In May, 1878, Mascart was appointed director of the Central Meteorological Bureau and was occupied with the regular publication of meteorological charts and with observations in this field in connection with the observatory on the Eiffel Tower.

In the electrical field, the name of Mascart is known especially by his different works on the theory and practice of this science, in which he was one of the early workers. Among his leading works are the "Treatise on Static Electricity" and the "Lessons on Electricity" which he published in collaboration with Mr. Joubert. He was also the author of the well-known works, "Elements of Mechanics" and "Treatise on Optics."

Mr. Mascart was a member of the Bureau of Longitudes, vice-president of the Consulting Committee of Arts and Manufactures and president of the Commission of Inventions, which is appointed by the minister of war for that department. He was grand officer of the Legion of Honor, and entered the Academy of Sciences in 1884, where he replaced the physicist Jamin. Many honors came to Mascart, who was recognized as one of the world's leading electrical scientists. In 1893 he visited the United States as an official delegate from France to the World's Electrical Congress held in conjunction with the Chicago World's Fair. He was received with marked respect and took high rank in an assemblage which embraced such men as Von Helmholtz, Ferraris and Rowland.

JOINT POLE LINES FOR LIGHTING AND TELEPHONE CIRCUITS

By Paul Spencer

Part II.

XIV. *Electric-light Transformers and Other Apparatus.*—Transformers belonging to the electric-light company and connected with the electric-light system may be placed and operated upon poles jointly used, provided such pole transformers shall be installed and maintained in accordance with the following requirements:

The transformers shall be of a standard type, in which the containing box is effectually insulated from contact with the enclosed coils and their connections; it being understood that in case a ground is employed upon the secondary circuit it shall be permitted also to ground the transformer box.

In no case shall the transformer, or its parts, or its connections, be located within a vertical distance of less than 40 inches above or below telephone lines, connections or attachments, excepting the specially protected telephone connections, ground wires and cables run vertically upon a pole in accordance with Article XIII.

Where the transformer is located upon a pole below telephone wires and attachments, the transformer shall be supported upon cross-arms belonging to the lighting company.

Where the transformer box, or any of its parts located upon a pole below telephone wires or attachments, comes within a horizontal distance of 20 inches from the center of the pole, the transformer shall be placed upon the outer face of the cross-arm away from the pole, leaving the space at the back of the pole free for the ascent of the employes of the telephone company.

Where the transformer comes within a horizontal distance of 20 inches from the center of the pole, and at the same time the top of the transformer box is less than a vertical distance of six feet below telephone wires or attachments, the electric-light company shall place upon the pole, and firmly fasten thereto, immediately above the transformer and not in electrical contact therewith, a wooden cover which shall prevent the employes of the telephone company from stepping or standing upon the transformer box, or its connections or metal parts.

Fuse boxes, lightning arresters, switch and cut-out boxes, and similar apparatus of the lighting company, when located below the telephone lines, connections or attachments, shall be installed upon the outer face of the electric-light cross-arms, away from the pole, leaving the back of the pole free for climbing.

Where such electric-light apparatus is located below telephone lines or attachments and within 20 inches from the center of the pole, it shall be of a type in which all live parts are covered and protected from accidental contact.

XV. *Telephone Cable Boxes and Terminals.*—Telephone cable boxes, terminal boxes and distributing boxes may be placed upon either side of poles jointly used, provided that the following conditions shall be fulfilled:

No telephone box shall be placed within less than 40 inches from an electric-light cross-arm.

Where the telephone box shall come below electric-light wires or attachments, the side of the pole opposite to the box shall be kept free as the climbing space through the telephone lines, wires or attachments.

The lighting company shall not be prevented from occupying and using space for making its vertical attachments to the pole as provided in Article XII.

XVI. *Electric-light Fixtures for Street Lamps.*—Fixtures, hangers or booms for street lamps may be attached to poles jointly used, and street lamps operated upon either the arc or incandescent system may be maintained upon the same; provided the fixtures and lamps shall conform to the following requirements:

The fixtures shall be placed upon the street side of the pole.

No fixture nor any of its metal parts shall be allowed to encircle the pole. All braces, guys, standards, or other metal parts of a fixture shall be restricted to the half of the pole toward the lamp, or to the half of the pole toward the electric-light cross-arms.

No street lamp, nor fixture, nor any brace or guy therefrom, shall come within two feet of any telephone cross-arm.

The lamp and its electrical connections shall be effectually insulated from its supporting fixture. The insulation used shall be of approved mechanical strength, and shall be able to withstand, when wet, a high-voltage breakdown test of a potential at least double that of the operating voltage of the circuit to which the lamp is connected.

No portion of any lamp shall come within a distance of 20 inches from the center of the pole.

XVII. *Guys on Poles Jointly Used.*—Every guy wire attached to a pole jointly used shall be insulated by the insertion of one or more strain insulators, according to its length and conditions, as follows:

One strain insulator shall be placed in every guy at a point betwen six and eight feet in horizontal distance from the pole; provided, always, that the insulator so located shall not be less than eight feet above the ground. In the case of short guys in which a point six feet from the pole would be less than eight feet above the ground, the strain insulator shall be placed eight feet in vertical distance from the ground.

A second strain insulator shall be placed in every guy which shall come within any of the following classes:

Head guys which run from one pole to the next pole of the line.

Guys which at any point pass over or under or are in any way exposed to possible contact with electric-light or power wires, other than those carried upon the guyed pole.

Anchor guys.

Guys which are attached to a conducting support, such as a rock, iron pole, bridge, or other metallic or conducting object.

Guys which are attached to a house or other building or structure.

In every guy so described the second strain insulator shall be placed at a point between six and eight feet from the pole, stub, tree, rock, structure, anchor, or other object to which the farther end of the guy is attached; provided, always, that the insulator so located shall be not less than eight feet above the ground. In the case of any guy in which a point eight feet from the object to which the farther end of the guy is attached is less than eight feet above the ground, the second strain insulator shall be placed eight feet in vertical distance from the ground.

In short guys, in which the two insulators here required would be located at the same point or near each other, the two insulators may be coupled in series and put into the guy together.

All guys except anchor guys shall preferably be attached to non-conducting supports, and shall preferably be so placed and maintained that no part of any guy shall come within eight feet of the ground.

All guys which cross a roadway or footway shall be carried at an elevation of not less than 18 feet above the crown of the roadway, and not less than 12 feet above the footway.

Every guy which passes over or under any electric wires other than those carried upon the guyed pole shall be so placed and maintained as to provide at all times a clearance of not less than two feet between the guy and such electric wire.

No guy shall be placed or maintained in contact with any other guy, nor in contact with a lead-covered cable, suspension or messenger wire or ground wire.

Both the lighting and telephone companies shall use their best endeavors to obtain and employ strain insulators having the following qualifications:

Mechanical strength equal to the tensile strength of the guys in which they are used.

Construction so designed that a rupture of the insulating material shall not result in parting the guy.

Insulating properties suitable to the voltages of the currents to which the guys are exposed.

XVIII. *Guys Between Electric-light Pole and Telephone Pole.*—Any guy which runs from an electric-light pole to a telephone pole or from a telephone pole to an electric-light pole shall be treated as in Article XVII. with regard to strain insulators, elevation and separation from wires, cables, messenger wires and from other guys.

No guy run by either company to a pole of the other company shall be so placed or maintained as to weaken or displace the pole of the other company.

XIX. *Railway Attachments.*—(A) Where poles are jointly used for telephone attachments and attachments of railway feeders, supporting or span wires, supporting brackets and line apparatus used in connection with the overhead construction of electric railways, the attachments shall be made in accordance with the foregoing articles, wherever the same are applicable, excepting as modified by the following paragraphs, which refer specifically to poles jointly used by railway and telephone attachments:

(B) Where the railway construction is of a type in which the trolley wire is supported by spans attached to two (2) separate lines of poles, and these two (2) lines of poles are to be used for the attachments of the lighting, railway and telephone companies, it is always preferable that the lighting, power and railway lines should be carried on one line of poles, and that the telephone lines should be carried on the other line of poles.

(C) Where the railway attachments and the telephone attachments are carried on one and the same line of poles, the railway feeders and attachments shall occupy a position on the pole below that occupied by the telephone cross-arms. If the poles carry also lighting and power attachments, these shall occupy the upper position on the pole and above the telephone attachments, subject to the provisions of Article IV.

(D) Where span wires and brackets for supporting or holding trolley and guard wires are attached to poles jointly used, the attachment shall be made as follows:

The span wires and supporting brackets may be attached to the pole at a height convenient for the railway operation.

The span wires and brackets may be attached to the pole by bolts passing through the pole.

Every span wire and bracket supporting trolley wires shall be effectually insulated from the railway potential.

(E) The railway feeders on poles jointly used shall be carried on cross-arms located on the pole approximately at the point of attachment of the supporting trolley span or bracket.

Where telephone attachments are located above such feeders, a horizontal distance of not less than 24 inches shall be maintained between the pole pins on the cross-arms carrying the railway feeders.

(F) On poles carrying railway attachments the lowest telephone cross-arm shall be at least two feet above any part of the brackets or span wires supporting the trolley wire and shall also be above the nearest railway cross-arm by a distance not less than 40 inches.

(G) Signal boxes, switches, cut-outs and similar railway apparatus may be installed on the pole at the point necessary for convenient operation, provided that they shall not be installed in such a manner as to interfere with the employes of either company in climbing the pole or to prevent the installation of vertical runs, as described in Articles XII. and XIII. When located below telephone lines or attachments, they shall be of a type in which all live parts are covered and protected from accidental contact.

Railway signal line wires, run on jointly used poles, and below telephone attachments, shall be installed so as to provide a climbing space through them of not less than 24 inches.

Connecting wires to such railway apparatus, run down the pole, shall be insulated and shall be attached to the street side of the pole, and maintained at a distance of not less than five inches from the surface of the pole.

(H) Whenever poles used by the railway company are too low to permit, under the terms of this specification, the attachment thereto by the telephone company of cross-arms for carrying their wires, the telephone attachments which may be made shall consist only of twisted pairs, or a single telephone cable.

Where only one such twisted pair is used, it may be carried on an insulator on the top of the pole, or on a side bracket.

Where more than one twisted pair is carried along the line of poles, the pairs shall be bunched together throughout their length and attached at or near the top of the poles. In no case shall the pairs so carried exceed 10 in number.

Where the telephone cable is attached to such poles, it shall not exceed 1½ inches diameter, and shall be placed at or near the top of the pole.

The attachment of twisted pairs or of telephone cable, as above, shall be so made as not to restrict the proper use of the pole by the railway company, and the railway company may use its standard methods of construction in installing its feeders, span wires, brackets, switches and any other appliances on such poles.

XX. *Insulation.*—Excepting where otherwise specified, every electric-light and railway line wire and connecting wire shall be covered with at least a standard triple-braided weatherproofed insulation.

XXI. *Induction and Leakage.*—In order to minimize as much as possible the disturbing noises to which telephone apparatus is subject, it is recommended that on poles jointly used the possible effect of such influences should be given consideration by both the telephone and electric-light companies in making their attachments thereto.

The telephone company shall use due diligence in the construction and arrangement of its lines, by transposition of its wires, and by any other available means not detrimental to its service, to preserve its lines from disturbing noises. Where the means available to the telephone company are not sufficient to make the circuits of the telephone company reasonably free from disturbances caused by the proximity of the electric-light company's lines, the electric-light company shall endeavor by such means as are reasonably within its power, to reduce such disturbing influences.

The following points, relating to running of electric-light wires, should be considered in connection with this subject:

Each circuit should retain the same relative position on pins and cross-arms throughout its course and should not jump from one set of pins to another set on the same cross-arm, nor from one cross-arm to another on the same pole.

Where the two or more wires of any electric-light circuit are present on a pole, such wires should be run on adjacent pins, and wherever practicable such circuits should not embrace the pole.

In some cases transpositions in the electric-light circuit will be of material aid in controlling the induction upon telephone lines.

Series lighting wires, especially of the alternating-current type, should be placed at the greatest possible distance from telephone lines.

In any case, where, by reason of length of exposure or other unavoidable conditions, the induction from any electric-light line causes a material impairment of service upon a telephone line, and where other available means are incapable of restoring the telephone service, then a wider separation between the electric-light line and the telephone line should be arranged for.

In the case of series lighting circuits, the special transpositions which must be placed in telephone lines in order to reduce the inductive disturbance require to be located with regard to the location of the electric lamps. It is important that the lamps once established should not be shifted except for necessary reasons, since a relocation of a lamp will often necessitate relocation in the transpositions of the telephone lines.

In the case of an alternating-current series lighting circuit, where the two wires of the circuit are on the same line of poles, it is important that the lamps should be uniformly distributed between both wires, since this tends to produce a balance of inductive conditions. In such a case, also, where the inductive disturbance remains severe, the conditions may be materially improved by transpositions placed in the lighting circuit.

XXII. *Current and Voltage.*—The character of current and the normal operating voltages of the electric-lighting, power and railway circuits carried on poles jointly used, as provided for in the several articles of these specifications, shall be only as follows:

Constant-potential metallic circuits, not to exceed 5,000 volts.

Alternating-current series circuits, not to exceed 5,000 volts.

Direct-current series circuits, not to exceed 7,500 volts.

Direct-current railway circuits, not to exceed 700 volts.

XXIII. *Limiting Attachments.*—Attachments should not be made by either company to the poles of the other company unless the conditions for any particular extension make such attachments necessary, but joint use of poles is always preferable to parallel or conflicting separate pole lines on the same side of a street, and the placing of separate lines of poles on the same side of a street should always be avoided.

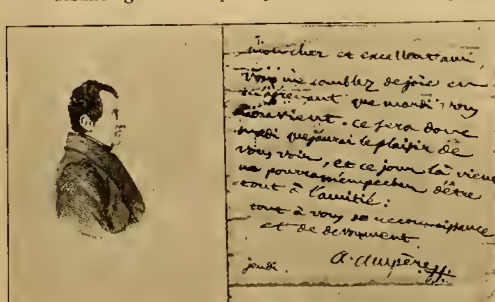
In erecting poles or constructing overhead lines upon poles not jointly used, each company should give careful attention to avoiding any possibility of contact or interference with the lines of the other company.

[*The end.*]

AMPERE POSTOFFICE

In order to facilitate the handling of its large volume of mail at the Ampere (N. J.) postoffice, the Crocker-Wheeler Company, manufacturer of electrical machinery, has erected on its grounds the brick and cement postoffice building illustrated herewith. The architecture is of a modern classical style which might be termed "Federal." Upon the pediment above the main entrance is an eagle and United States shield in high relief. The interior of the building is finished in quartered oak and the floor is of mosaic tile, upon the walls hang facsimiles of various historical documents, but of particular electrical interest is the autograph letter and portrait (reproduced herewith) of A. M. Ampere (1775-1836), whose name was given to the New Jersey electrical manufacturing town as well as to the universal unit of electric current.

The Building



Portrait of Ampere and Autograph Manuscript

A UNITED STATES POSTOFFICE BEARING A GREAT ELECTRICAL NAME

QUESTIONS AND ANSWERS

ACCURATE SPEED-MEASURING DEVICE

J. St. C., Provo, Utah: What is the most accurate way of measuring the speed of a revolving shaft, such as that of a dynamo or motor that runs at about 1,200 revolutions per minute with slight fluctuations?

ANSWER

Probably the most accurate way to determine the speed of such a shaft is to make use of a small specially designed magneto-electric generator connected to a good portable voltmeter. The voltage generated by such a magneto is strictly proportional to its speed; therefore its voltage may be taken as an actual measure of the speed. To determine the speed constant of the arrangement it is necessary only to take the voltmeter reading corresponding to a definite known speed of the shaft. The ratio of these values is the constant and any subsequent voltmeter readings multiplied by the constant give the actual speeds. Thus, if the voltmeter read 100 on its higher scale when the speed was actually 1,200 revolutions per minute, the constant is 12 and a reading of 98.5 will represent an actual speed of 1,182 revolutions per minute. In determining the exact speed while testing for the constant, use may be made for, say, one minute, of a reliable mechanical speed counter, provided the speed remains absolutely constant for that time, as may be determined by having another person observe the constancy of the reading of the voltmeter connected with the magneto, which is either belted to the shaft, or, better, direct connected to it.

When properly set up the indications of such a set are very accurate and sensitive to the slightest change of speed. To make the voltmeter readings more nearly direct-reading speed values, use may be made of a small resistance in the circuit between the magneto and voltmeter. By carefully adjusting it the constant may be made 10 or any desired simple value. The set must not be changed, however, as the substitution of another voltmeter or other resistance would change the resistance of the circuit and therefore the value of the constant, which would require a recalibration. Some instrument makers manufacture magneto sets of this kind to which a particular voltmeter belongs that has had its scale graduated to read directly in speeds instead of in volts. Such sets are called magneto-electric tachometers, and they are much more accurate than any mechanical tachometers or speed counters.

CHANGING A FAN MOTOR FOR A LOWER FREQUENCY

F. A. K., Oconomowoc, Wis.: How would it be possible to change the connections of the coils on a 110-volt, 125-cycle fan motor so that it will run economically and at normal speed on a 110-volt, 60-cycle circuit? The coils are eight in number and now connected in series.

ANSWER

Reducing the frequency of the current applied to the motor reduces its impedance and increases the current, hence if the coil connections were changed to anything but series the impedance would be still further reduced and the current would become so great as to burn out the coils. To cut the current down effectively, therefore, could be done, not by changing the coil connections, but by rewinding them with smaller wire. If this is not desired, a reactance or resistance should be placed in series with the machine, its value being such, depending on the size of the motor, as to reduce the voltage applied to the motor to a safe value.

ALTERNATING-CURRENT SERIAL

The Western Electrician's important serial on "Alternating Currents and Their Applications," written by Mr. E. R. Wolcott, formerly professor of physics and electrometallurgy in the Colorado School of Mines, will be begun in the issue of October 3d, which will be the Fall Trade Number. This series has been prepared with care to be up to date and of practical usefulness. It will run through 40 issues or more and will be a valuable and distinctive feature. An idea of the ground covered may be obtained from the following summary of contents:

I. General Principles—
  1. Introduction.
     Advantages of alternating currents; comparison with direct currents; mechanical analogies.
  2. Generation of Alternating Currents.
     Direct-current reversal; graphical illustration; cycle; frequency; sine curve; production of alternating currents; collecting rings; pendulum analogy; electromotive-force curve; the alternator.
  3. Measurement.
     Effective value of current; maximum value of current; comparison of voltmeter and ammeter construction.
  4. Transmission.
     Electrical energy; loss in transmission; advantage of high voltage; transformers.
  5. Induction.
     Fundamental principle of alternating currents; self-induction; effect of iron; solenoid; mutual induction.
  6. Transformer.
     Principles of the transformer; ratio of voltage; efficiency; copper losses; hysteresis; eddy currents.
  7. Impedance.
     Opposition to the flow of an alternating current; inductance; permeability; effect of frequency; reactance; use of π; the henry; ohmic resistance; reactance; expression for impedance.
  8. Graphical Representation.
     Components of electromotive force; calculation of inductance; curves of component electromotive forces; applied electromotive force; phase.
  9. Power.
     Calculation of power; power curves; lagging current; power factor.
  10. Polyphase Currents.
     Definition; advantage; two-phase system; two-phase, three-wire system; three-phase system; star connection; delta connection; current and voltage relation in star connection; current and voltage relation in delta connection; receiving circuit; power; economy.
  11. Capacity.
     Electrostatic induction; condenser; capacity of ordinary electrical systems; condenser in alternating current circuit; balance of inductance by capacity; the farad calculation of capacity reactance; alternating current curves; tuning electrical circuits.

II. Generators—
  1. General.
  2. Rotating Armature.
     Types; electromotive force; method of winding; exciting current; magnetic saturation; relation between terminal voltage and load; series-wound alternator; shunt-wound alternator; separately excited alternator; composite excitation.
  3. Rotating Magnetic Field.
     Advantages; details of construction; separate excitation; composite excitation; ventilation; voltage control.
  4. Inductor Alternator.
     Principles of.
  5. Operations of a Generator.
     General; collecting rings; commutator; brushes; bearings; starting; causes of insufficient voltage; static sparks from belts; shutting down.
  6. Parallel Operation.
     Synchronism; two-phase alternators; three-

phase alternators; methods of synchronizing; conditions for parallel operation; hunting; phase; capacity.

III. Motors—
1. General.
2. Synchronous.
Principles of; details of construction; necessity for exact synchronism; prevention of hunting; starting.
3. Induction.
Principles of; details of construction; advantages; induction of current in the rotor; operation of; rotating magnetic field; speed and torque; rating; starting; compensators; single-phase induction motors; starting by phase splitters.
4. Repulsion Motors.
Principles of; details of construction; advantages.
5. Single-phase Series.
Principles of; compensation of armature inductance; prevention of sparking; advantages of.

IV. Transformers—
Essentials of transformer construction; core type; shell type; type H; mounting of; cooling of; water cooled; air cooled; efficiency; iron losses; copper losses; all-day efficiency; regulation; connections; subdivided coils; parallel connections; auto-transformers; polyphase transformer; delta connection; Y connection; change of phase; constant current.

V. Rotary Converters and Motor Generators—
1. Advantages of; uses of; voltage; compounding; starting; inverted rotary converters; use of transformers, with connections.
2. Motor Generators.
Advantages.

VI. Lighting—
1. General.
2. Arc Lamps.
Enclosed; flaming.
3. Incandescent Lamps.
Carbon; Gem; tantalum; temperature coefficient of metallic filaments; tungsten.
4. Nernst Lamps.
Principles of; advantage.
5. Vapor Lamps.
Discharge of electricity through gases; mercury vapor; vacuum lamps.

VII. Thermal Applications—
1. Electric Heating.
2. Electric Furnaces.
Calcium carbide; graphitizing electrodes.
3. Induction Furnace.

VIII. Transmission—
1. General.
Effect of atmospherical conditions; insulation analogy; electrical surges; insulators; silent discharge; aging of insulation.
2. Protective Devices.
Principles of lightning arrester; induction of straight wires; effect of frequency; horn arrester; non-arcing metal arresters; multipath arrester; use of choke coil; connections; electrolytic arrester; grounded aerial wires; protection of low-tension side of transformers; grounds; suspended insulators; underground transmissions.

IX. Switchboard and Regulation—
1. Principles used in measurement.
2. Indicating and Recording Instruments.
Voltmeter; ammeter; wattmeter; phase meter; frequency indicator; integrating wattmeters; prepayment wattmeters; recording instruments; ground detectors.
3. Switches and Automatic Cut-outs.
4. Controlling Devices.
Tirrill regulator.
5. Oscillographs.

X. Summary.

AMERICAN PRODUCERS FOR AMERICAN COALS AND LIGNITES

By L. P. Tolman

Probably no invention has ever come into public favor in so short a time as the suction gas producer. Introduced into the United States about five years ago, this system of developing power from coal and lignite has already become a commercial reality and is fast gaining approval among engineers and power users.

That producer-gas power is a pronounced success in the United States is indicated by the large number of satisfactory installations already in operation on American coals. It is estimated that there are over 500 producer power plants in this country, having an aggregate of 150,000 horsepower. Of these, about 85 per cent. are of the so-called "suction" type and 15 per cent. of the "pressure" type. The suction plants average approximately 100 horsepower each, while pressure plants are usually built in sizes larger than 1,000 horsepower.

This article deals with suction gas power plants in single units of 200 horsepower or smaller, and complete plants made up of a number of such units, 1,000 horsepower or larger. This range of sizes covers the requirements of the great majority of power users.

The idea of the waste with steam is illustrated graphically in Fig. 1, which shows a modern steam plant, with its many complications, including a

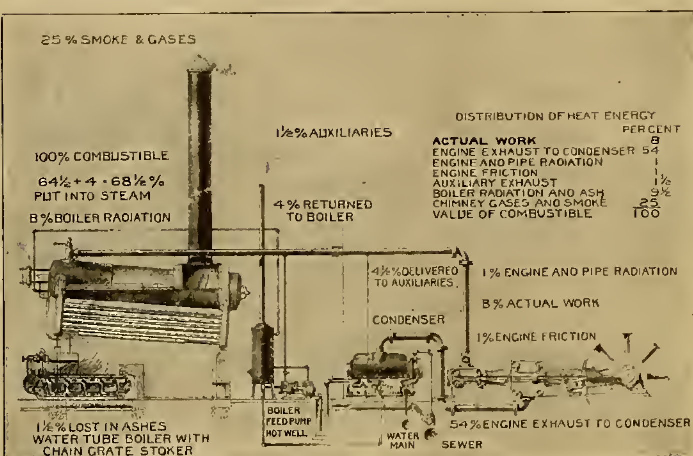


FIG. 1. COMPOUND CONDENSING STEAM PLANT

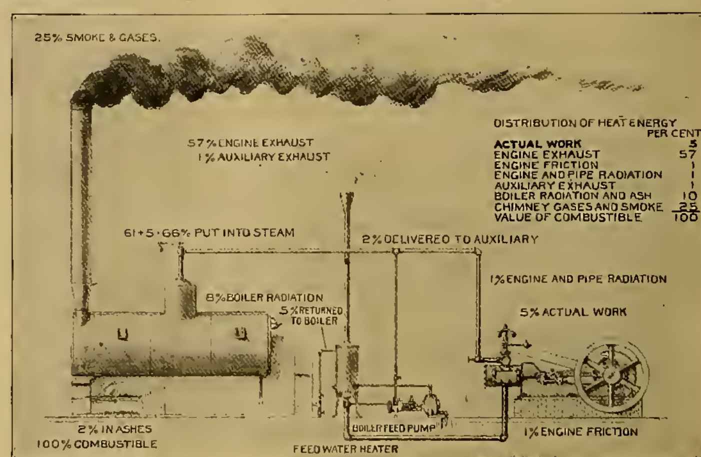


FIG. 2. SIMPLE STEAM ENGINE AND TUBULAR BOILER

compound condensing steam engine with a water-tube boiler. This plant converts eight per cent. of the total energy of the fuel into useful work, though in actual practice the percentage utilized is usually less. In other words, 92 per cent. or more of the energy in the coal goes to waste as smoke up the chimney, exhaust from the engine, heat radiation, etc.

Fig. 2 illustrates the ordinary throttling-governor steam engine with tubular boiler, a type which is in very general use, especially in sizes from 15 to 200 horsepower. This plant converts five per cent. (though usually much less) of the total energy of the fuel into useful work. In small steam plants the total amount of energy utilized is often not over two or three per cent. In other words, 95 per cent. or more of the energy in the coal goes to waste as smoke up the chimney, exhaust from the engine, heat radiation, etc.

Fig. 3 illustrates a suction gas-producer power plant. The apparatus is simple, reliable and surprisingly economical. With this plant 18 per cent. of the total energy of the fuel is converted into useful work, the exact amount varying according to conditions from 15 to 21½ per cent. This means that a suction gas-producer plant uses from one-half to one-fourth as much coal for a given amount of power as a steam plant.

The producer, in which the fuel gas is generated from coal, is almost as simple as an ordinary furnace for heating purposes. The gas engine is entirely automatic in operation and needs little more than the ordinary cleaning and care as to lubrication.

There is no danger from explosion or from fire. The plant is safe, even in the hands of men with little mechanical training, and the many plants which are in continuous operation, some of them 20 and even 24 hours a day, indicate that they are thoroughly reliable and will stand hard, everyday usage. Boiler insurance is unnecessary with producer plants, and the troubles and dangers encountered with steam boilers are entirely avoided. The complete gas engine and suction-producer plant is almost entirely automatic in operation, very little attention being required. Ordinarily the operator only needs to spend 10 to 15 minutes about every two hours to dump a few buckets of coal into the producer and give general attention to the plant. He can spend part of his time in other work, and an extra man as fireman is not required, even with plants from 400 to 500 horsepower.

No smokestacks are required, and, what is of greater importance, the smoke nuisance can be entirely abated.

Where the suction gas-producer plant uses 1¼ or 1½ pounds of coal, the steam plant commonly requires four to six pounds, or more. Moreover, with the producer plant there are fewer ashes to be handled and disposed of.

The producer will hold fire all night or even for several days, and the proper quality of gas can be generated after 15 or 20 minutes' blowing to revive the fire. The engine can easily be started on compressed air, and after getting up to speed it is then operated on producer gas.

The stand-over loss with the suction producer amounts to about one-third as much as with a steam boiler. In other words, where the stand-over loss with a steam plant for 14 hours amounts to 600 to 800 pounds or more, with a suction producer plant of the same horsepower this loss would not exceed 200 pounds.

Fig. 4 illustrates a sectional view of a Fairbanks-Morse anthracite suction gas-producer. All of the principal features are clearly shown. Coal is admitted to the producer through a hopper at the top. This has a double closure, so that fuel can be introduced without at the same time admitting air. In the process of partial combustion which takes place producer gas is generated.

The hot gas passes through a vaporizer in which a small amount of steam is formed, and which, with a limited amount of air, passes under the grate of the producer. In the smaller sizes the vaporizer is at the top of the producer, where it uses the waste heat from the escaping gas and where, at the same time, the water keeps the top from getting too hot. In the larger sizes the vaporizer is separate and connected to the producer by piping.

From the vaporizer the hot gas flows through the scrubber, which is merely a cylindrical-shaped tank filled with coke, over which a spray of water is constantly sprinkled. The large contact surface of the coke effectually cleanses the gas of dust and impurities carried over from the producer, and also acts to cool the gas, which is essential in order to prepare it for use in the engine.

With certain fuels, especially when much tar is encountered, it is also necessary to add a sawdust purifier in order to abstract the last traces of tar from the gas. While not absolutely essential, yet it is always advisable to use a gas tank between the scrubber and the engine, in which a certain amount of gas is stored in ready use for the engine. This is especially desirable where the loads are variable.

Anthracite in "buckwheat" or "pea" sizes, lignite, coke and charcoal are the fuels commonly used. The lignite producer offers a cheap and reliable power in sections where this fuel is available. There are large deposits of lignite in Texas, Arkansas, Louisiana, North Dakota, Montana, Wyoming, Colorado and other western states. This can usually be had at a price of from $1 to $3 a ton. At Smithville, Tex., where a 150-horsepower lignite producer plant is installed, the cost is $1.70 a ton. Lignite is of little value for steaming purposes, mostly due to the large amount of moisture, but it makes an excellent fuel for the producer, and in some respects is easier to handle than anthracite.

Producer-gas vertical engines are made in sizes of 200 horsepower and smaller. By combining several units, plants of 800 to 1,000 horsepower or larger have been installed. Fig. 5 illustrates a modern Fairbanks-Morse engine of this type.

The present system of ignition is a great improvement over the methods formerly used. The make-and-break igniter is so constructed that it can be adjusted to spark as early or as late as desired, and when engine is running or at rest, by means of a convenient hand lever. A single lever controls the time of ignition for all cylinders. This is a feature of much importance, especially with producer-gas, as it permits timing the ignition to give the greatest possible power and economy with any particular grade of gas and when the engine is running. In addition, there is an independent adjustment for each igniter, which is operated by a drop cam.

Both valves are mechanically operated from a single cam shaft, which is located inside the crank case. This minimizes the amount of noise. Furthermore, the two-to-one reduction of gearing includes a pinion which is made of alternate layers of steel and red fiber. These features insure a quiet-running engine.

The simple fly-ball governor is carefully designed. It operates a balanced disk valve which is so constructed that there is no frictional contact or surface to become fouled by any impurities in the gas.

Lubrication is effected by means of a single elevated oil reservoir, which is provided with separate brass pipes with individual sight-feed for each bearing. The drip from the different bearings collects in the base of the engine, which is drained by a small pump. The oil is run through a filter and is then used over again.

Each engine is fitted with a hand-operated speed regulator, by means of which speed can be reduced when engine is running.

One cylinder of each engine is fitted with automatic compressed-air starting gear. This can be thrown into or out of action by the movement of a single lever and the engine is started automatically on compressed air.

In Fig. 6 is shown a complete producer-gas power plant with the engine direct-connected to an electric generator.

The fuel consumption with producer plants depends upon a number of conditions, such as the quality and heat value of the coal used, the freedom from clinkers and excessive amount of ash, whether the engine is operating under nearly full load or under very light loads, and also whether the load is constant or rapidly fluctuating. Much also depends on the operator in charge of the plant. A careful and intelligent engineer will secure economical and reliable service.

The fuel consumption usually varies from a pound to one and one-quarter pounds per brake horsepower per hour at about full load, according to conditions and the quality of coal used. While economy tests with high-grade fuels, and also short-run tests, often show a lower consumption than stated, yet the figures submitted are conservative and give a fair idea of what may be expected.

A series of tests was recently made on a 150-horsepower Fairbanks-Morse engine and anthracite producer for continuous runs of 24 hours, the object being to determine the comparative economy at different loads. The coal used was an ordinary grade of "buckwheat" Pennsylvania anthracite. The fuel consumption per brake horsepower-hour at less than full load was found to increase per unit of power developed as follows:

Three-fourths load-consumption, 5.6 per cent. more per horsepower-hour than at full load.

One-half load-consumption, 21.5 per cent. more per horsepower-hour than at full load.

As the ordinary engine in use has a load factor of from 50 to 75 per cent., the above figures indicate that the producer gas engine is exceedingly economical, even under light loads.

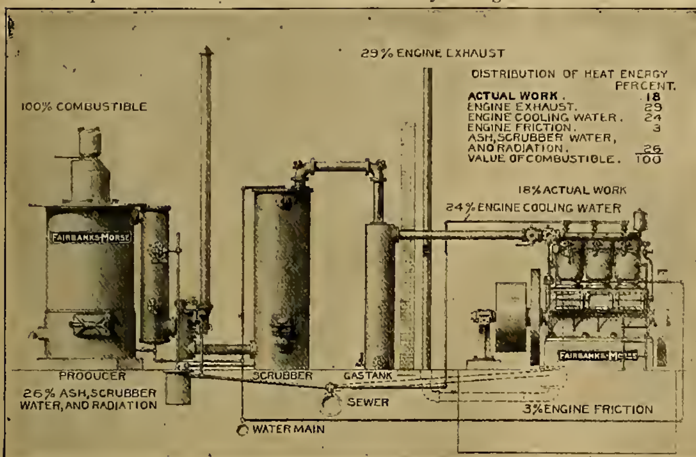


FIG. 3. SUCTION GAS-PRODUCER POWER PLANT

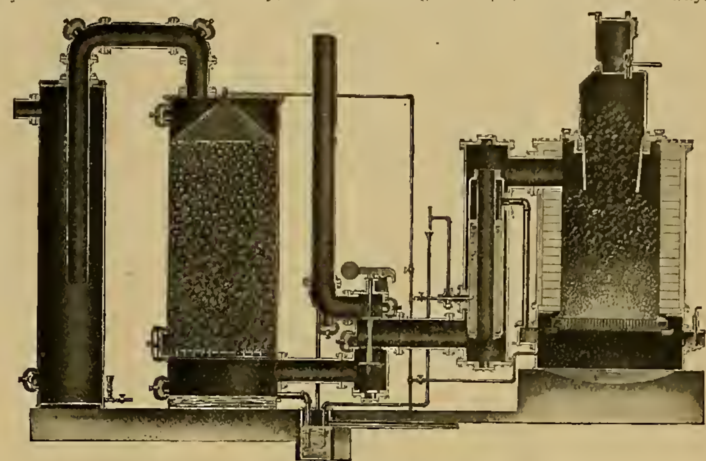


FIG. 4. SECTIONAL VIEW OF FAIRBANKS-MORSE SUCTION GAS PRODUCER

A USEFUL HIGH RESISTANCE

A new form of high resistance, described in the Physical Review by G. W. Stewart, employs a transparent lacquer called Zapon. This lacquer consists of soluble cotton dissolved in a mixture, the chief ingredient of which is amyl acetate. When dry, there is left a film of pyroxyline, which is elastic, is not subject to ordinary changes in temperature, does not evaporate, does not crack, and is a good insulator. When lampblack is mixed with this lacquer and spread with a brush upon an insulator, a permanent and yet high resistance is obtained. The conductivity of the film can be easily regulated by the amount of lampblack used and the thickness to which the lacquer is spread with the brush. By trial, the author secured a variation in resistance from 3,000 to 3,000,000 ohms with a film approximately three millimeters long and two millimeters wide.

To secure permanency and eliminate changes in contact, the terminals are made a part of the base on which the film is spread.

The author found the variation due to aging to be less than one-half of one per cent. with a variation of voltage of 1,000 per cent. A number of observations were made through small ranges of temperature, and the results show a variation of from 0.1 to 0.15 per cent. per degree Centigrade. The resistance increases somewhat with an increase in humidity.

NEW YORK ELECTRICAL SHOW

Preparations for the second annual electrical show to be held in Madison Square Garden, New York city, from October 3d to 14th, are well under way. Plans have been made for a number of exceptional features aside from the regular attractions of a show of this kind. The fiftieth anniversary of the laying of the first Atlantic cable will be fittingly celebrated by historical exhibits and special jubilee features. It is hoped that three great electrical inventors, Thomas A. Edison, Nikola Tesla and Guglielmo Marconi, will be present on these occasions.

Under the direction of Dr. E. F. Roeber a committee is gathering a striking exhibit of electrochemical and electro-metallurgical products and processes to show the rapid developments in these branches. Diamond-making by electricity will be one of the novelties.

In connection with the twenty-fifth anniversary of electric lighting in New York city, a comparative exhibit showing early and present lighting systems will be shown. New exhibits of wireless telephony and telegraphy, monorail car, telharmony and many other novelties will be installed.

Domestic applications of electricity as usual will receive a great deal of attention. The illumination of the show, it is said, will surpass all efforts in this line ever attempted. Festoons, arches, garlands and wreaths will be studded with about 400,000 lamps. Flaming arcs and a powerful searchlight will be used on the tower.

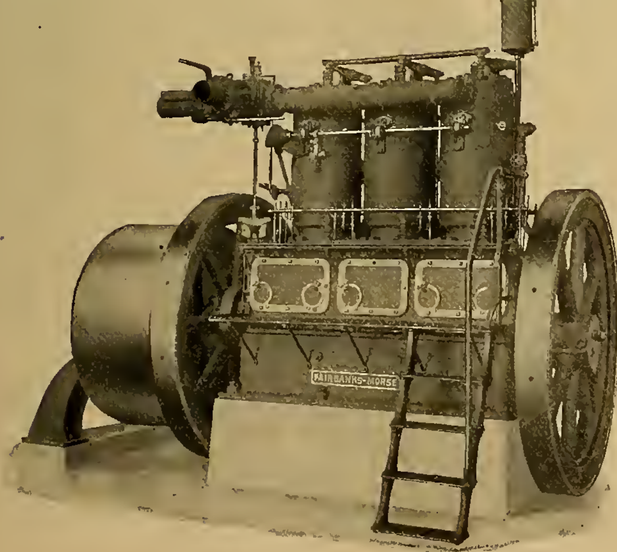


FIG. 5. MULTI-CYLINDER VERTICAL PRODUCER-GAS ENGINE

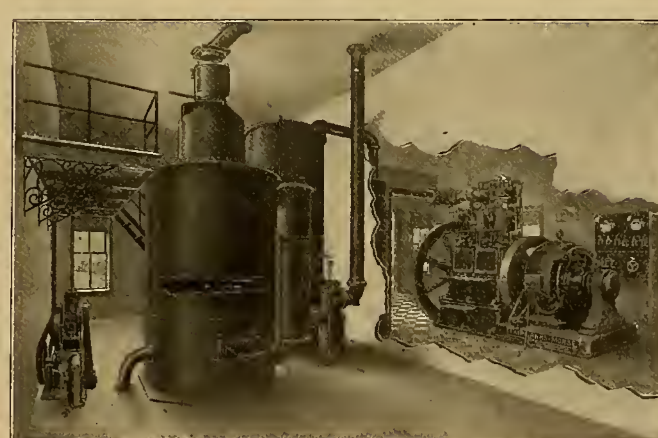


FIG. 6. PRODUCER AND GAS ENGINE DRIVING GENERATOR

Two new sleeping cars, built on the Pullman style, have been ordered by the Illinois Traction System and will be put into service between Peoria and East St. Louis. Officials of the company predict that the sleeping-car service will eventually be installed all over the system.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, September 2.—Preparations are being made at the Eiffel Tower wireless station for exchanging messages with New York. This will be the first time that messages are sent across the Atlantic to the Continent, as heretofore the only station which has accomplished this feat is the Poldhu station in the south of Ireland. The officials connected with the military-telegraph department, which controls the Eiffel Tower plant, state that they expect to receive a message from New York within a very short time. The experiments will be carried out during the night, in order to avoid the atmospheric disturbances which occur in the daytime and would be a serious drawback to the operation of the present apparatus.

Some time ago it was announced that the French Postoffice and Telegraph Department had adopted a new regulation by which stamps to the required amount could be attached to a telegraph blank containing the message and the latter placed in the letter box at the postoffice, whence it would be collected and sent at once, without needing to wait at the telegraph window. But the public has not as yet taken advantage of the system to any great extent, as it is feared that the right amount would not be placed on the telegram. In such case it would be sent as an ordinary letter. The minister of posts replied lately to this objection, stating that, according to the rules, a telegram of more than 10 words will have a margin of two words for 11 to 20 words and of four words for messages above 20 words. The receiver of the message is obliged to pay double the deficit, as for letters. This measure will no doubt give increased confidence in the present system; it is only applied to home messages.

Owing to the recent fire which occurred in the main telephone exchange of Paris, when a part of the switchboard was damaged and subscribers had their instruments put out of use for some time, the department is taking measures to prevent such accidents in the future. The trouble is usually caused by short-circuits, and such have been frequent for some time past. A commission of specialists has now been appointed by the minister, and it will examine the measures which are to be taken in this direction. The commission is headed by Mr. Bouchard, chief engineer of the telephone department.

France has lost one of its most eminent scientists by the recent death of Henri Becquerel, secretary of the Academy of Sciences and professor at the Museum of Natural History and the Polytechnic College. His career was adorned by numerous researches, among others in the field of optics upon the transmission of light by crystals, phosphorescence and polarization. His principal discovery was the property which uranium and its compounds possess of giving off radiations, now called radio-activity. This discovery finally led to that of radium by Professor Curie and opened up a new field for scientific work, throwing new light upon the constitution of matter.

In most of the countries of Europe the question of military telephones is occupying a prominent place, and the different administrations are engaged in preliminary measures in view of the next army maneuvers, as they expect that the telephone will occupy a prominent place in such events. During the maneuvers of the German army in 1905, 1906 and 1907 a number of trials of apparatus were carried out with a view of connecting the officers' headquarters with the troops during the combat. In Germany and Austria a type of field telephone has been adopted, which is very successful at present, and in France the military engineers are actively engaged in this work. A. DE C.

GREAT BRITAIN

London, September 5.—An additional British delegate has been appointed to the International Conference on Electrical Units and Standards in the person of Major O'Meara, the engineer-in-chief to the General Post Office. It will be remembered that the Congress meets in London on October 12th, and I know that special arrangements are being made for the entertainment of the delegates on the social side as well as on the business side.

A further step in regard to the much-abused surface-contact system of tramways in London has been the selection, by the London County Council of the president of the Institution of Electrical Engineers, Mr. W. M. Mordey, to inspect and report upon the system generally. Mr. Mordey has paid a preliminary visit to Lincoln, where the G. B. system has been such a conspicuous success, and is now going into the problem of its application to the thoroughfare with the heaviest traffic in London. Whilst Mr. Mordey may have been appointed as expert adviser to the County Council by virtue of his being president of the Institution of Electrical Engineers, it is also the fact that at one time he was connected with the company which worked the Dolter surface-contact system in Great Britain, so that he has some special knowledge of the subject.

The Manufacturers' Association of Great Britain has interested itself considerably in the new import duties which have been recently imposed upon goods entering Australia. As a result of its efforts there have been considerable modifications, and in many cases where the commonwealth government could not fall in with the suggestions of the Association with regard to reducing the duties on British goods, it has created or increased tariffs upon goods coming from other parts of the world. A great portion of the success of the Manufacturers' Association has been with electrical apparatus. For instance, a proposed 25 per cent. upon dynamo-electric machines up to 200 horsepower has been reduced to 20 per cent. Other classes of goods whereon a 20 per cent. duty was proposed will now be admitted free, while 25 per cent. tariffs on other goods have been reduced to 12½ per cent. The completed list of the new Australian tariff has just become available over here, and contains many modifications compared with those published a short time ago.

The announcement is made of the holding of an American exhibition in London next year, which will be known as the Golden West and American Industries Exhibition. It will be of a quite general character and will include specimens of American engineering work of all kinds. The present and prospective lord mayors of London are members of the advisory committee. An exhibition of this character has not been held in England for 20 years.

Some 230 firms have so far intimated their intention of exhibiting at the Manchester electrical exhibition, which will be opened on the first Saturday in October, and this number is said to be a record for a trade exhibition over here. G.

NEW ENGLAND

Boston, September 12.—It is calculated that the New England Telephone and Telegraph Company has materially strengthened its position in the northern part of its territory by its recent acquisition of three Independent telephone companies in Maine, with 4,500 subscribers.

In the city of New Bedford the Automatic Telephone Company has about 1,400 subscribers and in the eight years of its existence it has grown to be one of the most successful of the Independent concerns in the East. There is an automatic telephone company also in Fall River, operating 1,200 telephones, and the two cities have toll connecting lines.

Several of the electric-light companies of Massachusetts have filed their reports this week with the State Gas and Electric Light Commission. The Worcester Electric Company reports gross earnings of $334,529, net $162,478, dividends $90,730, surplus $71,748. The Cambridge Electric Light Company reports gross earnings $297,238, net $131,006, dividends $72,000, surplus $59,006. The United Electric Light Company of Springfield reports gross earnings $465,682, net $212,210, dividends $84,888, surplus $127,322. The Hyde Park Electric Light Company reports gross earnings $110,602, expenses $79,178, net $31,424, dividends $20,125, surplus $11,298.

The Worcester County Mechanics' Association is planning for a big mechanical and electrical exposition in Mechanics' Hall in Worcester, next March. A meeting of the association has been called by the trustees to act on the proposition. B.

NEW YORK

New York City, September 12.—William Marconi, the wireless-telegraph inventor, arrived in New York on the Cunard liner Caronia Thursday, accompanied by Jameson Davis, a director of the Marconi companies. In an interview the inventor explained his idea of erecting a new station at Cape Cod and leasing a land line to New York, 120 miles away. "When this has been done," he said, "we shall generalize the service across the Atlantic, and carry all kinds of press and commercial messages." Mr. Marconi added that when the Atlantic arrangements had been perfected he would turn his attention to the Pacific.

The Board of Supervising Engineers, Chicago Traction, has been summoned to meet at Schenectady on Tuesday to attend the tests to be made by the Public Service Commission in the works of the General Electric Company to ascertain the best types of fenders and wheel guards for street cars. Tests will be made with dummy figures.

Evidences of business revival are found in the report of the Western Union Telegraph Company for the quarter ended September 30th, partly estimated, which shows an increase in net earnings of $120,000 compared with the quarter ended June 30th. The net earnings of the September quarter are figured at $1,700,000. For the corresponding quarter last year there was a deficit of $311,000, but that was due to the strike, as the business depression had not begun. The directors declared a quarterly dividend of one-half of one per cent.

Certain medical men in New York have again revived the old discussion whether the electric current as administered in official execution of the death penalty really does kill or merely paralyzes until life ceases from some other cause. A member of the advisory commission appointed to inspect the first operation of the "electrocution" law, Dr. A. D. Rockwell, testifies that in the executions where he was an official witness, death followed instantly and quietly. There were no contortions or burning or anything unpleasant, with the exception of the sacrifice of a human life. "In the electric current," he says, "we have a method sure, decent and painless. It is a mathematical impossibility that any human being, receiving in proper form an electrical current of lethal energy, should appreciate even for a fraction of a second the slightest pain."

An action brought by the state of New York through Attorney-general Jackson to procure a judgment dissolving the New York City Railway Company on the ground that the company has been insolvent for more than a year prior to the institution of the suit, has been dismissed by Justice Davis in the Supreme Court. Justice Davis holds that the plaintiffs have failed to show that the company was insolvent for the period of one year, as required by the statute. Justice Davis also vacated the order appointing state receivers for the company. The company is now under federal receivership. W.

OHIO

Toledo, September 12.—The Toledo Railways and Light Company did a greatly increased business last week, during the national encampment of the Grand Army of the Republic. The total number of passengers carried during the six days was 1,117,356, bringing in a gross revenue from passenger traffic of $49,136.51, an increase of $16,140.63, as compared with the corresponding days of 1907. In accordance with a resolution of the board of directors previous to the encampment, 10 per cent. of this increase, or $1,614.06, was turned over to the committee as a donation to the committee having the matter of the encampment in charge.

The proposition to build a new $100,000 municipal lighting plant at Lima, Ohio, has found its way into the courts, and a long and bitter fight is promised. An injunction has been granted forbidding the Council reconsidering its action and repealing the legislation already passed. The Schoepf syndicate is seeking a renewal of its lighting contract, and will continue the fight.

An extra car on the Western Ohio interurban railway made the 30-mile run between Wapakoneta and Bluffton in exactly 35 minutes, including the slowdown through the central portion of Lima. The car was an empty, being rushed to carry a party to Fostoria, and broke all records of the road.

The Western Electric Company was the successful bidder for the generator for the new municipal lighting plant at New Bremen, Ohio, and work will be begun on its installation at once. The contract for the new plant was divided, the St. Marys Machine Company getting the engine, and the Westinghouse company the switchboard and connections. H. L. S.

INDIANA

Indianapolis, September 12.—The Evansville and Princeton traction line has added 12 miles more to its system by opening the Patoka extension. Cars are now run between Evansville and Patoka. The company is now planning for the next extension, which will include the task of bridging White River and the construction of a line farther north through Hazleton to Sullivan. When this extension is completed, trolley connection will be made with the Terre Haute, Indianapolis and Eastern traction line which will afford traction service between Evansville and eastern cities by way of Indianapolis.

The final survey of the proposed traction line from Danville to Rockville, a distance of 55 miles, has been completed. The company officials announce that considerable work will be done on the line this year.

The Chicago Southern Traction Company, an Illinois corporation, has taken steps toward the construction of an interurban line from Kankakee, Ill., to Lafayette, Ind. The company officials express anxiety to get a through line from Chicago to Indianapolis as soon as possible.

Careful inquiry among the local makers and agents of electrical apparatus indicates there is an increase in feeling of confidence, due to the encouraging prospect of a revival in the demand. These people are alive to every possibility of new business and say that they are informed that a number of new electric lines will be built in Indiana this and next year. They say the demand for electrical apparatus will be met more than half way in the extension of credit, and in this sort of co-operation the development of electrical enterprises will soon take on renewed activity.

The Commissioners of Marion County, Indianapolis, who some years ago installed a county light and heating plant for the court house and jail, are proposing to turn the plant over to the Indianapolis Light and Heat Company for the operating of it at a stated amount. It has been demonstrated in this case that county ownership and operation of such a plant is not any more successful than when such a plant is owned and operated by cities. S. S.

ILLINOIS

Peoria, September 12.—The Saline County Traction Company has been incorporated, with a capital of $5,000, with the principal office in Danville, to construct an electric railway within the county. L. E. Fischer of Danville, who heads the incorporators, is also the general manager of the Illinois Traction Company, so some connection with the McKinley system is inferred.

The owners of the electric-light plant at Havana expect to make some improvements as soon as the franchise question is settled. Milton Seibert of Pekin, one of the principal owners, has been looking after the purchase of the new machinery that will be needed.

It is probable the feed wires of the Peoria Railway Company will not be placed under ground, as the company has asked permission to run the wires around the "underground" district and thus save the cost of the conduits.

The Chicago, Burlington and Quincy Railway Company is having the telegraph instruments removed from the offices along the local line, near Havana, and will substitute telephones in the smaller stations to save the salary of an operator. The railway company has been experimenting with the telephone, and so far has found it satisfactory.

An ordinance introduced by the Springfield, Clear Lake and Rochester Railway Company, granting it the right to enter the city of Springfield over the tracks of the Springfield Consolidated Railway Company, has been sent back to the City Council for amendments, restricting the privileges of the railway company.

The Traction Lighting Company of Chicago has been incorporated with a capital stock of $100,000, to do a general mercantile and manufacturing business. The incorporators are Fred H. Atwood, Charles O. Loucks and Henry Tupper.

Mr. C. A. Howe of the Chicago office of the Holophane Company, who has been delivering a series of talks on "Illumination" in Springfield, will be in this city next week and deliver two lectures on the same subject under the auspices of the Peoria Gas and Electric Company and the various electrical contractors. V. N.

WESTERN CANADA

Winnipeg, September 12.—J. G. King, a prominent citizen of Port Arthur, Ont., has applied for an injunction restraining the city from erecting a storage dam at Current River Park, asserting that it is an unnecessary expense. Meanwhile the contract has been awarded to Stewart & Hewitson of Port Arthur, for the construction of the dam. The price is $35,000, and the dam will replace that destroyed by the floods last spring.

Through eastern financial agents the town of Kenora, Ont., has disposed of $40,000 of 5½ per cent. power bonds. The sale of these bonds will enable it to proceed with an electrical development.

Sealed tenders will be received by Hon. Adam Beck, chairman of the Hydro-electric Power Commission of Ontario, Toronto, Ont., until September 28th for the supply and erection of 63,500-volt, single-phase, or 110,000-volt, three-phase, transformers for operation on the commission's 110,000-volt transmission system and the manufacture, supply and erection, complete, of the switching and indicating apparatus for the 110,000-volt transformer stations. Apparatus is required for several transformer stations, regarding which information and plans may be obtained at the commission office, Continental Life Building, Toronto.

The Lethbridge Radial Tramway Company, with head office at Lethbridge, Alberta, has been incorporated to build electric car lines to carry passengers and freight to Stafford, Raymond and other towns in the vicinity of Lethbridge.

Good progress is being made by the Manitoba Telephone Commission in its extensions of the lines and improvements to the plants purchased from the Bell Telephone Company throughout the province. The new exchange in Winnipeg is practically completed and will be ready for occupancy before another month. At Portage la Prairie a new exchange will be built and new equipment installed throughout.

Judge Anglin, Toronto, Ont., has decided that the mayor of Galt, Ont., need not sign the contract with the Hydro-electric Commission, which was indorsed by the City Council. The application of mandamus compelling the mayor to sign was refused. This decision is contrary to the judgment of Judge Latchford in the case of the town of Berlin and the judgment of Chief Justice Falconer in the case of the city of Hamilton. This decision of Judge Anglin's is considered a hard blow for cheap power.

G. C. Smith, town clerk of Boissevain, Man., will receive sealed tenders September 28th for equipment for an electric-lighting plant, including boilers, engine, generators, switchboards and street-lighting apparatus. Alternative tenders for a gas-producer plant instead of a steam plant will be considered. Plans and specifications may be seen at the municipal offices at Boissevain, Man., and also at the office of W. E. Skinner, consulting engineer, Somerset Building, Winnipeg, Man. R.

PACIFIC SLOPE

San Francisco, September 10.—The long legal struggle between the Edison Power Company and the H. E. Huntington interests, as represented by the Mentone Power Company, for water rights in the Santa Ana Canyon, near Los Angeles, has been compromised, and the various lawsuits have been dropped. The Mentone Power Company will now go ahead with its plans for power development in the canyon, which are expected to cost in the neighborhood of $40,000.

R. Leo Van der Naillen, manager of the Oro Water, Light and Power Company, says that though the company has been obliged to close down its own dredgers, owing to lack of water to generate electricity, it is not likely that it will be obliged to shut off power from any of its customers. The power of this company is chiefly used in operating gold dredging plants.

J. W. Downing of Fort Jones, Cal., manager of the Klondyke mine, near that place, declares that unless the Siskiyou Electric Light and Power Company will extend its line down the river to the mine, the owners of the latter will develop electric power of their own from their water rights on the Klamath River.

The San Francisco office of the Fort Wayne Electric Works has secured the contract for 15 new transformers for the municipal electric-light and power plant at Palo Alto, Cal.

William Thornton, Harvey Bickerton and Fred Ray of Alta, Utah, are organizing a company for the purpose of putting in an electric power plant on Little Cottonwood Creek, two miles below Alta. O. H. Skidmore is drawing plans for a power plant to develop about 300 or 400 horsepower.

The Monterey County Gas and Electric Company of Monterey and Salinas, Cal., is preparing to make some improvements in its power transmission system at Salinas. Plans are now being perfected by F. J. Southerland, superintendent of construction, and H. L. Leck, chief draftsman.

A large number of bids were opened at Los Angeles, Cal., on August 31st, for electrical power machinery for the Owen's River aqueduct, but as many of the bids were made on a basis of f. o. b. Chicago or New York, no awards have yet been made.

J. D. Curry, Phœnix, Ariz., representative of the Vulture Mining Company, says that the owners of the mine will build a power plant on the Hassayampa River to furnish power and light for the Vulture mine and to operate an electric railroad between the towns of Vulture and Wickenburg.

The Cloverdale Light and Power Company held its annual meeting at Cloverdale, Cal., this week. Besides the election of officers, plans were outlined for the coming year. It was decided to extend the company's transmission system both north and south of Cloverdale and across the Russian River.

Secretary Dixon, of the Board of Public Works of San Diego, Cal., has filed in the clerk's office specifications for the lighting of D street, at a cost of $32,282. A.

PERSONAL

Mr. Edward Schildhauer, electrical and mechanical engineer of the Isthmian Canal Commission, formerly of Chicago, and Mrs. Schildhauer, have left the Canal Zone for the United States. Before returning to the Isthmus Mr. Schildhauer will investigate the mechanism of locks in the United States and Europe.

Mr. Malcolm MacLaren is the new professor of electrical engineering at Princeton University. Mr. MacLaren has been prominently connected with the electrical engineering departments of the British and American Westinghouse companies.

Mr. E. R. Conklin, manager of the Interstate Telephone Company of Northern Illinois, has resigned and will be succeeded by Mr. C. B. Cheadle of Joliet. Mr. Cheadle has been prominent in the affairs of the company, and it is expected that he will continue the existing policy.

Mr. Alexander D. DuBois, formerly assistant mechanical and electrical engineer, Illinois Traction System, has accepted an appointment as instructor in electrical engineering at Cornell University, where he took up his new duties on September 15th. Mr. DuBois hails from Springfield, Ill., and was graduated from the University of Illinois in electrical engineering in 1899. He has since been engaged in engineering work in Philadelphia, Chicago and on the McKinley traction lines.

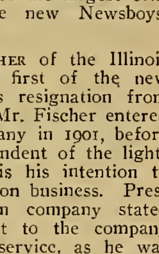
Mr. R. P. Gifford has been promoted to the position of general superintendent of the Houghton County (Mich.) Electric Light Company, one of the Stone & Webster properties, and has removed from Calumet to Houghton. His former position of assistant superintendent in charge of the Calumet division of the company has been filled by Mr. Herbert Nash of Tampa, Fla., who is a man of wide experience and has been with the Stone & Webster corporation for several years, having recently been connected with their interests in Florida.

Mr. Albion E. Lang received an unusual tribute on the occasion of his recent election to the presidency of the Toledo Railways and Light Company. The Toledo Newsboys' Association sent him a letter of cordial congratulation. "There is probably nothing that the association can do to assist you in any way," said the boys, "but we want you to feel that you have the appreciation and best wishes of the officers and members of this association at all times." Mr. Lang was one of the largest contributors to the fund for the new Newsboys' Building in Toledo.

General Manager L. E. Fischer of the Illinois Traction Company has set the first of the new year as the date on which his resignation from his position will go into effect. Mr. Fischer entered the service of the traction company in 1901, before which he had been the superintendent of the lighting company at Paris, Ill. It is his intention to enter into the railroad construction business. President McKinley of the traction company stated that it was a source of regret to the company to have Mr. Fischer leave its service, as he was an ideal manager and thoroughly able and reliable. Mr. Fischer will be succeeded by Mr. H. E. Chubbuck of LaSalle, Ill.

Mr. H. F. Parshall, an American, and a graduate of Lehigh University in 1887, who has established himself in Great Britain as one of the foremost electrical engineers of the kingdom, has received the honorary degree of master of science from his American alma mater. But as Mr. Parshall was at the time engaged in important consulting work in England, an international arrangement was perfected whereby the University of Liverpool performed the actual conferring of the degree. Many distinguished guests attended the special "congregation" of the University of Liverpool. Mr. Parshall holds several important consulting positions in England, is a member of many engineering societies on both sides of the Atlantic and is the author of a number of books.

Mr. H. E. Chubbuck, who is now the general manager of the Illinois Valley Railway Company at LaSalle, Ill., has been selected to succeed General Manager L. E. Fischer of the Illinois Traction Company, whose resignation will take effect on January 1st. Mr. Chubbuck will then have his headquarters at Peoria, and the operation of the extensive lines of the company will be directed from that city. The new general manager of the Illinois Traction Company comes of a family closely identified with the electrical industry from its slender beginnings in this country. His grandfather, S. W. Chubbuck, built the first instruments for Morse and later organized the old Telegraph Manufacturing Company. In this business A. S. Chubbuck, the father of H. E. Chubbuck, followed, and the third electrician of the line did his first electrical work in the same laboratory. He entered the ranks of the Thomson-Houston Company in 1882, and served it and its successor, the General Electric Company, for a number of years. He has installed or managed plants at Auburn, N. Y.;



H. E. CHUBBUCK

Springfield, Ohio; Omaha, Neb.; Pueblo, Colo., and Quincy, Galesburg and LaSalle, Ill. Mr. Chubbuck has been closely identified of late years with the McKinley interests, whose traction operating head he is now to become. He is an associate member of the American Institute of Electrical Engineers and is also secretary of the Illinois State Electric Association. He has a large acquaintance and is popular with electrical men.

ELECTRIC LIGHTING

It is proposed to establish a $7,000 electric-light plant at Danbury, Iowa.

The McCook Electric Light Company has been granted a 20-year franchise at McCook, Neb.

The People's Light Company has been incorporated at Corpus Christi, Tex., with a capital stock of $30,000.

The Reservation Electric Light Company is erecting a plant at Toppenish, Wash., and will furnish a 24-hour service.

At Paonia, Colo., the Paonia Electric Light and Power Company has been incorporated with a capital of $10,000.

The Beebe (Ark.) Light and Power Company has been incorporated with $10,000 capital stock. J. S. Smith is president.

J. S. Malloy of Spokane, Wash., and others have organized a company with a capital of $100,000 to put in an electric-light plant at Sunnyside, Wash.

The city of Abbeville, S. C., will purchase and rebuild the Abbeville Electric Light and Power Company's plant. S. M. Orr, city electrician, is in charge.

The American Light and Water Power Company of Kansas City has been awarded the contract for the extension of the Stillwater, Okla., light and water system, at a cost of about $75,000.

At Breathedsville, Md., the Antietam Electric Light and Power Company will install a 100-kilowatt electric-light plant, comprising an alternating-current generator and two 40-inch waterwheels.

A number of improvements are being made by the Rockford Electric Company to its plant at Rockford, Ill., the cost being in the neighborhood of $40,000. The waterwheels are being overhauled and additional ones, with direct-connected generators, are being installed. Two motor-generator sets are to be provided for changing the alternating current to either 550 and 275-volt direct connected or vice versa, as conditions may require.

The recent annual report of the Edison Electric Illuminating Company of Boston records that the company's gross earnings for the year ended June 30, 1908, amounted to $4,229,239, or $208,619 more than those for the previous year; while its operating expenses involved $2,690,419, or $98,596 more than those for the preceding year, leaving net earnings of $1,538,820, or $110,026 more than those for the fiscal year ended June 30, 1907.

ELECTRIC RAILWAYS

The Oklahoma, Kansas and Missouri Interurban Railway Company has been organized at Miami, Okla., to build a line from that city to Lincolnville.

Through cars are now running from South Bend to Hammond, Ind., on the new line of Chicago, Lake Shore and South Bend Railway Company.

The Kansas City and Olathe electric railway, running from Kansas City southwesterly through the Turkey Creek valley, has been completed and put in operation to Shawnee, Kan.

The survey for an interurban line from Fort Worth to Mineral Wells, Tex., via Weatherford, has been completed. Messrs. Duffy and Mosely, capitalists of St. Louis, Mo., may build the line.

An electric interurban railway, backed by the McKinley system, is being planned to connect Eldorado, Harrisburg and Carrier Mills, Ill. W. A. Haas of Lincoln is having a preliminary survey made.

The Fort Smith-Oklahoma Light and Traction Company of Fort Smith, Ark., has been incorporated, with a capital of $30,000. It is proposed to operate electric railways in Oklahoma and Arkansas.

The new Bergen tunnel of the Lackawanna Railroad, which will be put in operation on November 15th, has been equipped with conduits to convey power cables for an electric third-rail system. Everything is so arranged that at short notice the motive power could be changed from steam to electricity. The floor is also arranged to accommodate the third rails and it is said that following the elimination of the Susquehanna grade crossing and others further out, electric motive power will be installed. The signal wires and telegraph lines are conveyed through the new tunnel in water-tight conduits.

It is planned by the new owners of the electric line between Saginaw and Flint, Mich., to at once supply the missing link from Frankenmuth to Flint, thus completing the long-talked-of through line between Saginaw and Detroit.

Five per cent. bonds of a par value of $1,600,000 have been issued by the Scioto Valley Traction Company of Columbus, Ohio. The traction company owns and operates high-speed third-rail lines from Columbus to Lancaster and from Columbus to Chillicothe, Ohio, embracing 78 miles of track.

The Independent Construction Company of Terre Haute, Ind., has incorporated, capitalized at $150,000. The company proposes to do a general contracting and construction business, making a specialty of constructing electric railroads. Geo. C. Foulkes, Robert Herkimer and W. H. Harris are directors.

If telegraphic advices from Lazy Lane, near Bridgeport, Conn., are to be credited, potato bugs on the rails stalled eight trolley cars laden with excursionists for Lake Compounce a short time ago. Furthermore, in spite of the terrific slaughter, the bugs held possession until the car men could sand the tracks.

POWER TRANSMISSION

The Eastern Michigan Power Company of Au Sable, Mich., has filed articles of incorporation with the secretary of state at Lansing. The capital stock is $10,000.

The Great Western Power Company, in California, will run another 15,000-foot tunnel parallel to the first one. It will be an 18-foot bore, and will double the power capacity.

The Hattiesburg (Miss.) Traction Company will develop a waterpower on the Bouie River and build a plant to generate and transmit electricity; 100,000 horsepower is said to be available.

The Montgomery (Ala.) Light and Water Power Company will run a new transmission line from Tallassee to Montgomery. The expenditures which the company has planned will amount to $100,000.

The lowest level of water in the Hudson River in the last 25 years was reached recently, with the result that the electric power usually transmitted to Schenectady was supplanted by current generated at the steam plant at the General Electric Company's works.

Willamette Falls, near Oregon City, Ore., have been completely bottled up, it is said, by the big dam built for the Portland Railway, Light and Power Company. The power is to be used for transmission electrically and also for running pulp and paper mills directly.

A 10,000-horsepower development on the John Day River, in Oregon, is planned by a company which has acquired rights on 30,000 inches of water and the right-of-way for a seven-mile flume, in which distance there is a fall of 500 feet. George C. Schlegel of Pendleton, Ore., is one of the promoters.

The Oregon Water and Power Company has been incorporated under the laws of Indiana, with a capital stock of $25,000. The purpose of the corporation is to develop waterpower and the generation of electricity in the state of Oregon. The home office will be in Indianapolis. Frank M. Fauvre, Wm. E. English and Monroe George are directors.

Steel pipe purchased in Europe for the Great Western Power Company for its power plant at Big Bend, near Marysville, Cal., has begun to arrive. The hardware for the insulators is expected shortly, on the arrival of which the stringing of the cables on the steel towers will be begun. Foundations for special towers are now being laid at various points.

The Kesler Cotton Mills, one of the largest plants of the kind in the neighborhood of Salisbury, N. C., has begun the use of electric power from the Southern Power Company, which has just completed its lines from Charlotte to Salisbury. The current has been turned on first at the Kesler mills, and later will be connected with other important industries in that section.

The Northern Colorado Power Company has decided to increase its bond issue from $3,000,000 to $6,000,000, to provide money for proposed extensions to its transmission lines and to increase the capacity of its power plant at Lafayette. It was provided that the outstanding $3,000,000 be retired, and the present holders will receive a like amount of the new bonds. The additional $3,000,000 in bonds will be utilized for construction work. Transmission lines will be extended from Greeley to Lafayette by way of Brighton. The company is planning to supply a large amount of power for irrigation purposes.

The Hydro-electric Power Commission, at a recent meeting, decided to call for tenders for transformer stations at the Falls, and for the necessary stepdown stations along the route of the proposed transmission lines for Western Ontario. It is expected the total cost will be in the neighborhood of $1,000,000. The time for receiving tenders will close on September 28th.

A hydro-electric plant to develop about 20,000 horsepower is proposed on the Arkansas River, near Hutchinson, Kan. By damming the river and building a concrete flume a fall of 90 feet can be utilized. The Hutchinson Chemical and Alkali Company and other manufacturers would benefit by the cheap power. John R. Watson of the chemical company has made the preliminary plans.

The Kansas-Colorado Electrical Transmission Company has plans completed for its proposed power stations at Garden City, Kan., and Florence and La Junta, Colo. Each station, it is estimated, will cost $800,000. The city of Pueblo, Colo., is seeking the location of the fourth plant in its midst. The general offices and shops of the company and its allied railroad are already assured to Pueblo.

It is reported that the Western Maryland Coal and Coke Company will develop waterpower on the Youghiogheny River and build an electric plant to generate and transmit 15,000 horsepower for coal mining, lighting and other purposes. It is estimated that three dams (30, 75 and 100 feet high) will accumulate enough water for turbines to develop this amount of power. The estimated cost of the plant is $1,000,000.

The Kaukauna (Wis.) Gas, Electric Light and Power Company, which is composed of Milwaukee capitalists, has leased the new 2,500-horsepower electric power plant just completed by the Green Bay and Mississippi Canal Company. Part of the power will be distributed to paper mills to operate the electric motors in their plants, and 1,500 horsepower will still be available for new manufacturing concerns that expect to move to Kaukauna.

The British Columbia Electric Railway Company will enter upon extensive improvements in connection with the waterpower operating its Lake Buntzen generating plant, building a large dam at the mouth of Lake Coquitlam and lining the tunnel connecting Lakes Buntzen and Coquitlam at a combined cost of over a quarter of a million dollars. Connected with the scheme is the installation of another electrical unit of 10,000 horsepower at the generating plant, bringing the capacity of the electric supply up to 32,000 horsepower.

The national committee for the conservation of natural resources has made public its first schedule on which the inventory of the country's natural resources is being conducted, and it indicates an intention to hunt down waste in all its forms and to devise some means to prevent it. Relating to waterpower, two of the inquiries are as follows: "Are existing developed waterpowers put to their full use?" "To what extent can coal be saved by the substitution of waterpower?" Under the head of flood waters, the commission inquires, "To what extent are flood waters wasted?"

TELEPHONE

The Whitewater (Kan.) Telephone Company has been incorporated with a capital stock of $10,000.

The Home Enterprise Telephone Company will expend $20,000 in improving its system at Woodward, Okla.

The Grayson County Telephone Company is arranging to expend $75,000 in installing a new system at Denison, Tex.

The Canadian Long Distance Telephone Company has been incorporated with a capital stock of $10,000 and headquarters at Canadian, Tex.

The offices and exchanges of the Petersburg (Ind.) Telephone Company and the Cumberland (Ind.) Telephone Company have been destroyed by fire. Both companies will re-establish exchanges and install new switchboards.

Directors of the Chicago Telephone Company have voted to capitalize $4,500,000 of the company's surplus and reserve accounts and give the new stock to the old shareholders. Owners of the stock will be entitled to one new share for every five they hold. This gift to the stockholders will bring the company's total capital up to $27,000,000. For a time at least the directors have fixed the dividend at the rate of eight per cent. a year. Heretofore the company has paid 10 per cent. a year on its capital. Present holders of 10 shares of stock on which they have been drawing $100 a year in dividends will hereafter have twelve shares on which they will draw $96 a year. The difference makes a total saving of $90,000 a year to the company, while the dividend remains at eight per cent.

The two telephone companies operating at Michigan City have reached an agreement to consolidate. They are the Central Union and the Merchants' Mutual, the former with 1,114 and the latter with 884 telephones. The result is expected to be a new telephone system of approximately 1,700 telephones, all having connection with the Central Union and Independent toll lines.

During the last few weeks a number of Indiana telephone companies have purchased automobiles to be used in rebuilding the lines. A large automobile can be used to great advantage in stringing telephone wires. The messenger strand is attached to the rear axle of the automobile and is pulled up perfectly. When the point of proper tension is reached the car is stopped immediately, and, without any opportunity to slip back, the strand is properly secured.

PUBLICATIONS

The Novelty Incandescent Lamp Company, Emporium, Pa., issues an attractive set of calendar post cards in colors, one for each month.

September "Paistery" tells about condulets, receptacles, taplets, crossovers, weatherproof sockets and things like that, for which the H. T. Paiste Company of Philadelphia is noted. "Aleck" does some of the talking.

The Holophane-D'Olier metal reflector for industrial lighting is the subject of bulletin No. 10 of the Holophane Company, New York. These reflectors are made in a variety of styles for use in places where breakage might curtail the life of the glass reflector, and are all designed to cast "the light on the object, not in the eye."

Bulletin No. 1111, just issued by the Fort Wayne Electric Works, is devoted to electric-motor drives applied to machine tools. After pointing out the advantages of electric drive and the strong points of both direct-current and alternating-current Fort Wayne motors, about 18 pages are filled with excellently engraved half-tone illustrations of these motors applied to a variety of machinery, direct-connected, geared and belt or chain driven. The company may be addressed at Fort Wayne, Ind.

The Electric Storage Battery Company of Philadelphia, Pa., has just issued "Hand Book IP," which is a publication of special interest to dealers and contractors. It treats of the application of the chloride accumulator to small isolated electric lighting and power plants for factories, residences, etc., where electric service from central stations is not available. It shows how the advantages of a 24-hour electric service are made possible by the use of a battery of these accumulators, entering fully into the subject and giving illustrations of the types of batteries and switchboards required for installations of different capacities. Specifications and prices for complete installations are given.

A number of interesting bulletins have been recently published by the General Electric Company. An attractive pamphlet (No. 3687) on transformer steel gives a brief history of the material now used for this purpose and calls attention to the type H transformers in which this steel is used. Bulletin No. 4611 gives a detailed description of sewing-machine motors, and contains dimension diagrams, weights and other data in connection with them. These motors are adapted for some 70 of the standard types of both stationary and drop-head machines and are suitable for domestic use, dressmaking and tailoring, and for light manufacturing. Direct-current and 60-cycle alternating-current motors are described for 110 and 220 volts. In Bulletin No. 4612 is described an automobile instrument, consisting of a combination ammeter and voltmeter enclosed in a dust-proof and moisture-proof aluminum case, and which is designed to withstand the constant vibration and exposure incident to service on electric vehicles. A conveniently portable Thomson direct-current test meter is described in Bulletin No. 4615. This instrument is designed for rapid and yet accurate tests of the meters on customers' premises and is made in two sizes, having each a number of distinct ampere ratings, and one or two potential windings.

SOCIETIES AND SCHOOLS

The Kansas Gas, Water Electric Light and Street Railway Association will hold its annual convention in Pittsburg, Kan., on October 8th and 9th. James D. Nicholson of Newton is secretary.

Within two weeks after the close of the Ohio Electric Light Association's convention Secretary D. L. Gaskill of the association sent to all the members and guests complete lists of the active and associate membership and also a list of the remaining electric-light companies in Ohio that are not now members. He urges each member to get some of these companies to join the association.

WIRELESS COMMUNICATION

A new wireless-telegraph plant has been installed at the Kahuku station of the Hawaiian group. A message was picked up recently from the battleship West Virginia, of the approaching fleet, while the ships were still 1,000 miles at sea.

The Australian government proposes to erect five "wireless" stations at Cape York, Thursday Island, Goode Island, Port Moresby and at Freeman's Island. The two stations of Cape York and Port Moresby will have a range of at least 350 nautical miles, while the Freeman's station will work to 300 miles.

Mr. Marconi arrived in New York a few days ago. His object now is to complete and perfect the service between Canada and the other side. He said: "We have experienced great difficulty with the land lines from Canada, and want to get a big station nearer to New York. What we intend to do is to perfect the station at Cape Cod for receiving transatlantic messages there." Mr. Marconi said that the Cape Cod work probably will be completed by Christmas. Then his attention will be given to wireless work on the Pacific side of the continent.

TELEGRAPH.

A fire in the offices of the Western Union Telegraph Company at San Angelo, Texas, on September 2d, destroyed all the wires and did $75,000 damage to the tenants.

The Pennsylvania Railroad has begun to install concrete telegraph poles along its right-of-way and has chosen a long stretch of exposed track between Pittsburg and Chicago for the experiments, which will be carried on throughout the winter. If found satisfactory, the entire system will have the new concrete pole.

Plans have been completed for a German submarine cable to Brazil. This will be the third cable to connect Germany with the Western Hemisphere, the other two extending from New York to Emden. The present cables to Brazil are under the control of England and France. The new line will cross the Spanish islands of Teneriffe. A branch will lead to the German West African colony via Liberia. It is expected that construction will soon be begun, and rushed with all possible dispatch. The negotiations now completed have extended over a long period of time, during which many difficulties have been encountered.

MISCELLANEOUS

Some electricians prefer to have the handles of their pliers insulated, although the protection afforded is perhaps doubtful on account of the likelihood of the other hand or a tool touching the live part. The insulation is usually done by wrapping insulating tape around the handles. An improved way, which looks neater, gives better insulation and is easier on the hands, is obtained by using ordinary rubber gas hose which is slipped over the handles. A little powdered soapstone or soft soap may be used to slip the hose over the handle.

The Hiner Stone Company of Lima, Ohio, has purchased the entire properties of the Pugh Stone Company of that city and will improve them by the construction of a modern stone-quarry plant. The crushers, screens and all other machinery are to be electrically driven. These improvements will cost about $10,000.

TRADE NEWS

The extensive locomotive repair shops of the Grand Trunk Railway System at Battle Creek, Mich., have been nearly completed. The Arnold Company of Chicago was the engineer and supervisor.

The Société Anonyme Electrométallurgique, Procédés Paul Girod of Ugine, France, has appointed C. W. Leavitt & Co. of 220 Broadway, New York, as its selling agent for the Girod process of the electrical manufacture of steel.

Ervin & Mahoney is the firm name of a new electrical wiring and supply house about to open in Hartford City, Ind. The firm will do a general electrical business in the neighboring towns as well. H. E. Ervin will be the head electrician and G. Mahoney the manager.

The Crescent Insulated Wire and Cable Company of Trenton, N. J., announces that it has made arrangements with the Metropolitan Electrical Supply Company, 184 Lake Street, Chicago, to represent it in the West. The Metropolitan company will handle a complete stock of Crescent wires, cables, etc.

Bids will be received at the office of the supervising architect of the Treasury Department, Washington, D. C., until October 2d for an electric push-button mail lift in the postoffice at Meriden, Conn., in accordance with drawing and specification, which may be obtained at the office named or at the office of the superintendent of construction at Meriden.

The business of the Elliott Brothers Electric Company has been purchased by the S. K. Elliott Electric Company, which has just been incorporated. The new company is better prepared than ever to handle with dispatch all kinds of repairs and supplies for electric railways, central stations and isolated plants. The headquarters of the company are at 322 to 328 Champlain Avenue, N. W., Cleveland, Ohio.

The San Francisco correspondent of the Western Electrician writes that the transcontinental railroads will, in a few weeks, issue their new classification list, to become effective on November 1st. It is now definitely known that the list will increase the minimum carload on nearly all commodities. In the case of castings and iron and steel articles generally, the minimum is increased from 30,000 to 36,000 pounds; in waterwheels the minimum is advanced from 24,000 to 30,000 pounds.

DATES AHEAD

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

Kansas Gas, Water, Electric Light and Street Railway Association (annual meeting), Pittsburg, Kan., October 8th and 9th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

Sons of Jove (annual meeting), Buffalo, N. Y., October 15th and 16th.

Illinois State Electric Association (annual convention), Illinois Hotel, Bloomington, October 27th and 28th.

American Electrochemical Society (fall meeting), New York city, October 30th and 31st.

Association of Car Lighting Engineers (first annual convention), Chicago, November 16th to 21st.

Chicago Electrical Show (fourth annual), Coliseum, January 11th to 23d, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) September 8, 1908

897,866. Signaling Apparatus. George F. Atwood, East Orange, N. J., assignor to Western Electric Company, Chicago, Ill. Application filed February 26, 1906.

A magneto telephone set has the bells mounted inside the door of the containing case.

897,868. Electric Ignition Device or Sparking Plug for Internal-combustion Motors. Charles O. Bastian and George Calvert, London, England. Application filed June 27, 1906.

The electrodes of this spark plug are separated by a glass tube insulator.

897,906. Lightning Arrester. Frank P. H. Knight, Keokuk, Iowa, assignor to Electric Service Supplies Company, Camden, N. J. Application filed June 28, 1907.

In this device there is an automatic circuit-breaker in shunt to a portion of the air gaps and having separable contacts to disrupt the normal arc, whereby the discharge path remains unaffected during the operation of the circuit-breaker.

897,938. Process for the Manufacture of Cement. Willoughby E. Snyder, Nazareth, Pa. Original application filed July 20, 1904. Divided and this application filed March 11, 1907.

The process of calcination consists in subjecting the material to a series of electrically generated heats and in the employment therewith of an air current through the successive heats from the final to the initial heat.

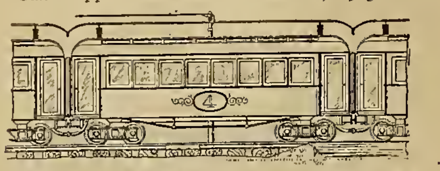
897,950. System of Electrical Distribution. Joseph L. Woodbridge, Philadelphia, Pa. Application filed January 20, 1908.

A rotary converter is provided for, which has main and auxiliary poles, the latter being excited in response to changes in the alternating-current side of the system.

897,960. Electric-arc Lamp. Pierre M. Capitaine, Les Lilas, France. Application filed November 11, 1907.

This lamp has a differential mechanism including a beam to which the magnet cores are suspended by chains and carbon holders suspended by threads from a drum.

897,965. System for Transmitting Electric Currents to Cars. John J. Eagan, San Francisco, Cal. Application filed October 18, 1905.



No. 897,965.—REVERSED TROLLEY ARRANGEMENT

The trolleys are supported by means of long horizontal arms to the stationary trolley poles. The cars carry long contact skids on top that engage the trolleys. (See cut.)

898,030. System of Regulation. Joseph Bijur, New York, N. Y., assignor to the General Storage Battery Company. Application filed April 4, 1906.

A storage-battery booster has two fields, one in series with its armature for compensating armature reaction and the other excited by the working circuit.

898,052. Electric-arc Lamp. Robert E. Leve, New York, N. Y. Application filed January 22, 1908.

This flaming-arc lamp has a suspended gravity-feed electrode carriage which sustains a pair of dependent converging electrodes. The feed is governed by differential magnet coils.

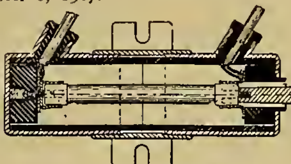
898,055. Electric Battery. William MacMillan, New York, N. Y., assignor of one-half to Egbert Winkler and one-half to John J. Walsh, New York, N. Y. Application filed August 18, 1902. Renewed February 2, 1905.

A primary battery consists of a negative element surrounded by cloth and a positive element surrounding the negative one and entirely covered by cloth.

898,058. Means for Regulating Dynamo-electric Machines. Wilbur L. Merrill, Schenectady, N. Y., assignor to the General Electric Company. Application filed February 20, 1906.

A motor to be run at absolutely constant speed has its armature current supplied by a motor-generator set, the generator of which has three field windings.

898,061. Fuse Box. Harry P. Moore, Newburyport, Mass., assignor to the Chase-Shawmut Company, Boston, Mass. Application filed April 8, 1907.



No. 898,061.—FUSE BOX

At one end of a cylindrical case is a hole for the withdrawal of the fuse. (See cut.)

898,063. Hair Crimper and Curler. Paul E. Oswald, Los Angeles, Cal. Application filed August 22, 1907.

This instrument has an electric heating coil composed of a spirally wound enamel-covered resistance wire.

898,073. Apparatus for Speech Transmission. Herbert E. Shreeve, Wyoming, N. J., assignor to the American Telephone and Telegraph Company. Application filed October 15, 1907.

In a telephone apparatus there is a transmitting element comprising a vibratory electrode and means for supporting it upon the casing, both electrode and supporting means being capable of free lateral expansion.

898,083. Electric-light Fixture. William Amstalden, Amador City, Cal., assignor of one-half to Aaron Weil, Amador City, Cal. Application filed December 31, 1907.

An extension drop fixture has a spring-controlled drum for winding a slack wire, a pawl and ratchet detent for the drum, and an alarm actuated by the movement of the pawl under the control of the ratchet.

898,086. Multiple Electric Fuse Cut-out. Wilhelm Boehm, Berlin-Charlottenburg, Germany. Application filed June 8, 1907.

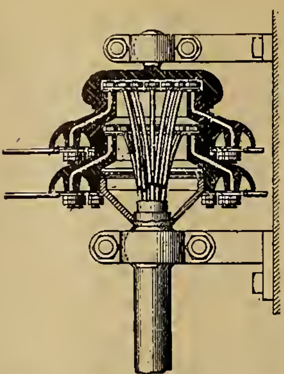
Metal bands are fastened at intervals on a core and joined by a fuse wire. Line contacts can be connected to one pair after another of these bands as the fuses in the plug give way.

898,095. Signal Box. Frederick W. Cole, Newton, Mass., assignor to the Gamewell Fire Alarm Telegraph Company, New York, N. Y. Application filed July 10, 1906.

A fire-alarm box contains a telephone and means for transmitting different alarm signals.

898,097. Terminal for Electric Cables. Charles W. Davis, Edgeworth, Pa., assignor to the Standard Underground Cable Company, Pittsburg, Pa. Application filed December 23, 1907.

Each conductor of a multi-core cable is molded into an insulating head and extends to points outside of its internally threaded part. (See cut.)



No. 898,097.—TERMINAL FOR CABLES

898,104. Circuit Closer for Call-bells. Robert Henderson, U. S. Navy. Application filed June 4, 1906.

A knob or handle suspended by the circuit wires contains contacts normally separated because of the weight of the knob, but which are closed by a spring when the knob is lifted.

898,133. Apparatus for Producing Voltaic High-current Arcs. Harry Pauling, Gelsenkirchen, Germany, assignor to the firm of Salpetersäure-Industrie-Gesellschaft, G. M. B. H., Gelsenkirchen, Germany. Application filed July 29, 1907.

The arcs are produced in the vicinity of the poles of a strong magnet.

898,173. Process of Producing Ferro Alloys. Frederick M. Becket, Niagara Falls, N. Y., assignor to the Electro Metallurgical Company, Chicago, Ill. Application filed May 25, 1908.

The process consists in electrically smelting a charge containing a refractory oxide ore, a source of iron, calcium carbide and a suitable flux, the carbide being present in proportion to yield a metallic product low in carbon.

898,182. Junction Box for Electrical Conductors. James F. Burns, Philadelphia, Pa. Application filed January 17, 1908.

The box has a rectangular prismatic body with rounded ends threaded to fit conduits. A number of holes for branch leads are provided and covered by a side plate.

898,189. Electrodeposition of Alloys. Sherard O. Cowper-Coles, London, England. Application filed August 2, 1907.

This method of depositing brass consists in employing an anode of brass together with an anode of zinc and an anode of copper and varying the current passing through the latter anodes as desired.

898,195. Supervisory System for Telephone Lines. William W. Dean, Chicago, Ill., assignor to the Kellogg Switchboard and Supply Company, Chicago, Ill. Application filed October 31, 1903.

In one strand of the cord circuit is a supervisory lamp and in the other is the supervisory relay, which is adapted to shunt the lamp when operated.

898,197. Wireless-telegraph Apparatus. Halsey Dunwoody, U. S. Army. Application filed May 21, 1907.

In a radio-telegraph circuit there is an aerial, means to impress oscillations thereon and a current rectifier or separator in the aerial containing silicon and carbon.

898,216. Electric-railway Conduit. Elmer E. Granger, Chicago, Ill. Application filed August 4, 1906.

A surface-contact system has a conduit containing a continuous conductor and a series of electromagnetic switches.

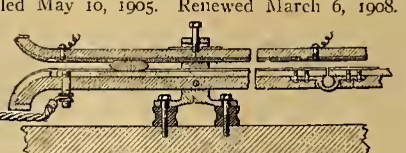
898,218. Electrical Piano-playing Instrument. Alvin L. Hart, Burlington, Iowa. Application filed November 29, 1902.

The piano action is operated by a series of electromagnets controlled by make-and-break devices.

898,219. Railway Electric Signaling. Job Hutchinson, New York, N. Y. Application filed May 10, 1905. Renewed January 4, 1907.

A block-signaling system for electric railways has a continuous third rail for the power current and a sectional signal conductor adjacent thereto.

898,220. Contact Rail for Electric Railways. Job Hutchinson, New York, N. Y. Application filed May 10, 1905. Renewed March 6, 1908.



No. 898,220.—CONTACT RAIL FOR ELECTRIC RAILWAYS

The third rail for the above system is provided with a sectional cover, carrying a supplemental rail and resting by gravity over the rail, so it is adapted for vertical movement on brackets when a contact shoe is rubbed between these rails. (See cut.)

898,221. Railway Electric Signaling System. Job Hutchinson, New York, N. Y. Application filed January 2, 1906. Renewed May 20, 1908.

This is a modification of No. 898,219.

898,231. Refrigerator. Joseph O. La Madeleine, Montreal, Quebec, Canada. Application filed May 23, 1907.

A low-water electric alarm is provided for.

898,283. Telegraphone. Harve R. Stuart, Wheeling, W. Va. Application filed September 24, 1907.

Associated with a movable carriage are a recording magnet and an erasing magnet.

898,295. Fire Alarm and Extinguisher. Clark Wilson, Hackettstown, N. J. Application filed November 21, 1907.

The valves of a sprinkler system and an electric alarm are simultaneously operated by the burning of inflammable restraining cords.

898,296. System for Controlling Trains. Paul Winsor, Weston, Mass., assignor to the Union Switch and Signal Company, Swissvale, Pa. Application filed August 12, 1905.

In this system there are relatively long and short blocks, the former having track signals and the latter automatic stops and both being electrically controlled.

898,310. Carriage-return Mechanism for Typewriters. Elmer A. Burlingame, San Francisco, Cal., assignor to the Burlingame Telegraphing Typewriter Company. Application filed May 11, 1908.

An electromagnetically controlled electric motor drives a friction disk which returns the carriage to initial position.

898,313. Electric Recorder for Ice Plants. William D. Cain and Wade H. Williams, Durant, Okla. Application filed May 9, 1908.

This is an electromagnetic device for recording the passage of blocks of ice.

898,324. Electric Signaling System. Elmer R. Coe, Wilkinsburg, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Application filed May 11, 1908.

A railway-signaling system contains transformers for impressing the signaling current on the track rails.

898,346. Apparatus for the Treatment of Gases. Sebastian Z. de Ferranti, Grindleford, England. Application filed June 10, 1907.

Apparatus for carrying out gaseous endothermic reactions consists of a shifting electric arc for heating the gases to the reaction temperature, together with nozzles for subsequently cooling the gases.

898,370. High-tension Magneto. Edward B. Jacobson, Pittsfield, Mass., assignor to the Pittsfield Spark Coil Company. Application filed January 16, 1907.

The armature has two windings inductively related. The primary contains a condenser and make-and-break mechanism. The secondary has spark terminals and a distributor.

898,391. Chandelier-hanging Device. Olof Peterson, DeKalb, Ill., assignor of one-half to Thomas D. Temple, DeKalb, Ill. Application filed August 8, 1906.

Into a dished crow's-foot is fitted the head of the chandelier with its depending extension and threaded nipple or union which has side ports for the wires.

898,404. Process of Making Articles by Electroplating. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to the Edison Storage Battery Company, West Orange, N. J. Original application filed October 5, 1903. Divided and this application filed November 3, 1906.

The process of making a storage-battery receptacle consists in electroplating copper on a former, plating a film of nickel on this coating, and in plating a film of iron on the nickel film, whereby a seamless can will be produced.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired September 15, 1908:

459,422. Dynamo-electric Machine and Motor. E. Thomson, Lynn, Mass.
459,447. Fibrous Carbon Battery. J. H. Robertson, Rutherford, N. J.
459,448. Telegraphic Apparatus. W. E. Sloan, J. E. Hughes and O. S. Reed, Chicago, Ill.
459,452. Elevator Signal. F. Andrews and R. H. Day, Minneapolis, Minn.
459,465. Electric Switch. B. W. Allen, Boston, Mass.
459,491. Method of Making Plates for Secondary Batteries. S. C. C. Currie, Philadelphia, Pa.
459,508. Dynamo-electric Generator or Motor. J. Hoduit, St. Louis, Mo.
459,509. Conduit for Electric Wires. H. W. Jones, New York, N. Y.
459,510. Electric-arc Lamp. E. R. Knowles, Brooklyn, N. Y.
459,514. Incandescent Electric-lamp Socket. J. O. Phillips, New York, N. Y.
459,523. Cable Box for Electric Wires. J. N. Keller, Newton, and J. A. McCoy, Somerville, Mass.
459,535. Secondary Battery. Wm. L. Silvey, Lima, Ohio.
459,591. Electrical-alarm System. J. P. McMahon, Jersey City, N. J.
459,605. Electric Push. J. F. Wollensak, Chicago, Ill.
459,610. Dynamo-electric Machine. E. Desroziers, Paris, France.
459,615. Annunciator. F. Richie, Highland Park, Ill.
459,633. Railway Signal. H. C. Horstman, Naperville, Ill.
459,678. Electric Motor. J. W. Davis and J. B. Farrington, New York, N. Y.
459,704 and 459,705. Electric-light Fixtures. E. T. Greenfield, New York, N. Y.
459,706. Electric Snap Switch. G. W. Hart, Kansas City, Mo.
459,707. Automatic Danger Signal for Railways. W. I. Herrick, Schodack Landing, N. Y.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, SEPTEMBER 26, 1908 No. 13

ELECTRIC SIGNS IN NEW YORK CITY

By William Fyfe Turnbull

New York City is remarkably well situated for the effective display of electric signs. A continuous water front of over 60 miles on both sides of the Hudson and East rivers and along the upper bay affords a stage of unequaled magnitude, while the traffic of half a million people daily over bridges and ferries supplies an equally vast audience. Furthermore, Broadway, one of the most crowded streets, runs diagonally across Manhattan Island, intersecting the main avenues at acute angles and necessitating the existence of many open triangular spaces which are excellent points for display. Unfortunately, many of these are occupied by unsightly billboards or equally objectionable painted signs, but the number of electric signs is increasing and the signmakers tax their ingenuity for the production of novel and spectacular effects. Colored signs are surprisingly seldom seen, but the continuous blaze of white-light signs on stores and theaters on Broadway between Twenty-third and Sixty-sixth streets has earned for it the name of "White Light District" and "Great White Way." Other cities having similar displays have adopted these names from New York.

In addition to the multitudes of people who cross the rivers and bay daily, going to and from their homes, are the crowds thronging the Hudson River steamers, Long Island Sound liners and ocean liners; visitors from all parts of the country who must pass through the port of New York and for whom the enormous and brilliant signs are "sights" to be seen and remembered long afterward. New York is thus a strategic point for the advertising manager as well as a first-rate arena for the electrician.

The city's electrical display really begins with the wonderful government searchlight at Sandy Hook, continues with the fairylike illumination of the amusement parks at Coney Island and the tower of the 40-story Singer Building, which can be seen several miles at sea, and reaches its climax as one enters the harbor in a group of the largest electric signs in the world strung along the water front.

TIMES SQUARE, BROADWAY AND FORTY-SECOND STREET, NEW YORK, AT NIGHT

First in point of size of letters is the sign of the Butterick Publishing Company, placed on the wall of the company's 12-story building at Spring and Macdougal streets. The sign consists of the single word "Butterick" traced in a double row of lamps. The initial "B" has a height of 68 feet, or about five stories of the building, while the other letters are each 35 feet high.

Somewhat smaller as regards individual letters but enjoying the distinction of being the largest roof sign in the world is that of Colgate & Co., the soap and perfume makers. This sign, shown by one of the accompanying night photographs, all of which are reproduced by the courtesy of the New York Edison Company, stands on the New Jersey side of the Hudson on the roof of an eight-story concrete factory in Jersey City, commanding a view of lower New York and the harbor. The sign as a whole measures about 50 by 200 feet.

At the left end is a clock whose dial has a diameter of 38 feet by day and 40 feet by night, since the groups of red lamps marking the hour spaces extend one foot beyond the edge of the dial; its area is 1,134 square feet. The clock mechanism weighs approximately six tons. The minute hand is 20 feet long, weighing nearly a third of a ton, and travels at its point 23 inches every minute, or over half a mile each day. Minute and hour hands are outlined with white lights, but the dial is unlighted except at the hour spaces on its circumference.

The upper line of letters is 20 feet in height and the lower line 13 feet. The letters alone require about 1,300 four-candlepower lamps for their illumination. In order that they may have the appearance of bands of light rather than fine lines, wide troughs are built around the lines of lamps and painted white to serve as reflecting surfaces. In summer the reflecting surfaces are painted black on the theory that at that season of the year the sign is viewed more by daylight than at night.

Several miles north of this and also on the New Jersey shore may be seen the roof sign on the factory of Jas. Pyle & Sons, at Edgewater. This consists of the word "Pearline" repeated twice, one sign being mounted on the south side of the factory and the other on the east front facing the river. The former has a length of 200 feet, while the latter is 150 feet long, the letters in each case being 25 feet high. This sign, therefore, has the largest letters of any roof sign. About a mile north of this and 200 feet above the river, on top of the cliffs of the Palisades, stands a remarkable electric sign advertising a real estate development. This is 200 feet in length and 20 feet high.

Between these two signs on the north and Jersey City on the south one may see in rapid succession the displays of the Lackawanna, Erie and

Pennsylvania railroads mounted on the roofs of their respective terminal buildings, and also the signs of the Hamburg-American and North German Lloyd steamship companies. Each of the latter consists of three words placed on the ends of three neighboring pier sheds. The North German Lloyd is lighted letter by letter, then extinguished and lighted again complete, while the Hamburg-American sign is stationary. The Hamburg-American Company formerly operated a unique changeable or "talking" sign on the end of one of its pier sheds, which by means of 39 letters in three lines displayed in succession 12 distinct phrases descriptive of its tours in all parts of the world.

On the New York side of the Hudson the signs most noticeable from the water front are those of Heinz's pickles, the Butterick Company, National Biscuit Company, the Twenty-third Street Railroad ferries and Anheuser-Busch Brewing Company. The beer sign is colored partly red and orange as well as white; and a broad strip of reflecting surface back of the colored lamps is painted the same color as the lamps in order to accentuate the effect of the latter.

Traveling up Broadway one notices a colored real estate sign on the third story of the Flatiron Building at Twenty-third Street; a red-and-white sign high up on the tower of Madison Square

Showing Changing Sign of Edison Company
BROADWAY ARCADE, NEW YORK, AT NIGHT

Garden announcing each week the plays at the Garden Theater, also several signs around the open square near by, most of them painted on sheet-iron and illuminated by reflected light. At Herald Square, Broadway and Thirty-fourth Street, and again at Times Square, Broadway and Forty-second Street, are seen brilliant displays, some white and others colored, advertising well-known brands of spring water, whisky, skirt lining and carriages. The view up and down Broadway from this point is a dazzling succession of hotel and theater displays, the general tendency being to use an overwhelming amount of light for brilliancy of impression rather than a smaller quantity, which would enable the sign to be more easily read.

At the intersection of Broadway, Ninth Avenue and Sixty-sixth Street is a large changing sign belonging to the New York Edison Company, which announces in succession the names of a number of new buildings that use the company's system for light, power and elevators. This sign is estimated to be read daily by 200,000 people on account of its proximity to several street-car and elevated lines. Another brightly lighted center is found at One-hundred-and-twenty-fifth Street and Seventh Avenue. Both of these streets are very wide, and several theater and mercantile signs vie with one another for brilliancy and pleasing color effects.

In addition to the noticeable signs mentioned, there are, of course, hundreds of small signs projecting from buildings or placed over shop doors. In most of these the lamps are simply inserted in white block letters, two-candlepower and four-candlepower being most commonly used.

The present ordinances of New York city relating to signs are very stringent, although, as one may observe, they are not in every case strictly enforced. Roof signs must not exceed a height of nine feet above the highest part of the cornice, unless built on two frames, one behind the other, in which case the rear frame may have a height of 18 feet (in order to make visible a nine-foot sign). Wall signs may be of any size, but must not project more than one foot from the wall nor obstruct any openings, such as windows. All signs must be constructed of fireproof materials. Signs extending out at right angles from buildings must not project more than six feet, nor have any point less than 10 feet above the sidewalk. The prospective owner of a sign is required to file a full description of the proposed work, including cost, with the city clerk. This is required to be in triplicate. A certificate must then be secured from the Department of Buildings that the construction of the building has been inspected and found to be in accordance with the legal specifications. The sign may then be built, but no current turned on without proper certificates from the Board of Fire Underwriters and the Department of Water Supply, Gas and Electricity as to the character of the wiring and fittings. Signs projecting over the sidewalk pay an annual license fee of 10 cents per square foot. As a result of these regulations, fewer large signs are being built and several which formerly were notable have now been dismantled.

ILLINOIS CENTRAL ELECTRIFICATION

Stimulated, no doubt, by the widespread agitation on the South Side of Chicago for the electrification of the Illinois Central Railroad within the city limits, the president of the company caused to be made public the following statement on September 16th:

"At a meeting of the board of directors of the Illinois Central Railroad Company, held in New York today, authority was given for a full investigation of the question of electrifying our terminals at Chicago. It is the purpose of the company to go into this question fully and immediately, securing the most able experts in the country to investigate the matter. After a full and complete investigation a report will be made to the board of directors on the subject."

But this very general statement gives no assurance that the improvement will be made; it merely announces that the subject will be investigated. It is regarded with skepticism and the agitation will not be suspended. As the Chicago Daily Tribune says: "Electrification will take time. But that time will be long or short in almost exact proportion to public pressure for relief."

Much will depend on the character of the engineers who conduct the investigation. The logical man to do this work, of course, is Bion J. Arnold of Chicago, who has had more experience in the electrification of railroads than any other man in the country. Furthermore, the public knows Mr. Arnold to be honest and the railroads have confidence in him as a sane, well-balanced, fair-minded engineer.

The Chicago Daily News goes a step farther than this, and thinks that the city ought to take part in the investigation. In an editorial printed on September 17th it says: "Chicago, however, ought to take a hand in this investigation. Bion J. Arnold, who devised the plan for electrifying the New York Central terminal, has furnished notable service to this city in the past and still is serving it most acceptably as chairman of the Board of Supervising Engineers which has charge of the work of rebuilding the local traction lines. Why should not Chicago secure his assistance in clearing away engineering problems which seem too difficult for solution to the Illinois Central engineers, if any such problems arise during the promised investigation? In any event this city should not rest satisfied with an adverse decision by the authorities of the Illinois Central. It should take steps at an early day to discover whether or not the engineering features of the smoke-banishing proposition are being worked out fairly from the public's point of view."

What lends an element of doubt to the situation is the fact that the Illinois Central has been considering the question of electrification at various times for 15 years without taking definite action, except that it is believed that the comparatively new side-entrance suburban passenger cars are so designed that they can be converted into motor cars at comparatively slight expense. The Illinois Central has eight tracks into its downtown terminal. There are two tracks for suburban local and two for suburban express service, two for through passenger trains and two for freight. In addition the trains of the "Big Four," the Wisconsin Central and the Michigan Central run into Chicago over the tracks of the Illinois Central. It is said that L. C. Fritch, assistant to the president of the Illinois Central, has gone to New York to study operating conditions on the electrified terminals of the New York Central and the New York, New Haven and Hartford, although it would

This Sign Faces the Hudson and Is About 200 Feet Long. The Dial of the Clock is 40 Feet in Diameter
PROBABLY THE LARGEST ELECTRIC ROOF SIGN IN THE WORLD

seem that this information might have been obtained long ago.

The Tribune has interviewed Bion J. Arnold on the subject, and Mr. Arnold expressed his belief that it would not be difficult, from an engineering point of view, to electrify the Illinois Central terminal. He added: "The New York Central and the New Haven roads are handling all kinds of passenger trains in and out of the Grand Central terminal every day with great efficiency, and they could handle freight trains just as well if there were any reason why they should take their freight

LARGE AND EFFECTIVE ROOF SIGN ON NEW YORK SIDE OF HUDSON RIVER

trains into the city. I think the action of the Illinois Central directors in taking up the subject of electrification is much to their credit and I believe they will make a success of it."

An interesting statement in connection with the discussion is to the effect that the Illinois Central Railroad Company will use as a basis for figuring the cost of electrifying the suburban lines the estimates already said to have been furnished by the Commonwealth Edison Company for power to operate the trains.

An electric railway now being surveyed from Paducah to East Cairo, Ky., is expected to be connected with the lines of the Illinois Traction Company at Cairo. Perhaps the latter system will cross the river on a bridge of its own, as at St. Louis.

ELECTRIC RAILWAYS IN THE UNITED STATES

In discussing the growth of the electric interurban railway in the United States, before 200 members of the Central Railway Club at Buffalo, N. Y., W. H. Evans, master mechanic of the International Railway Company, gave the following facts:

There are in the United States 1,238 electric railway companies, with a total mileage in 1907 of 8,842 miles, operating 68,636 electrically equipped cars, sweepers and locomotives, with a total of all other cars of 17,568, making a grand total car equipment on these railways of 86,204, with a total capital stock of $2,251,525,882.

Within recent years there has been quite a tendency among steam railroads to electrify a part of their systems and substitute electricity for steam as a motive power. Many of these heavy tarction lines, using seeam and electricity over the same tracks and that are still in the progress of installing electric rolling stock, have the following equipment:

Baltimore & Ohio R. R., 8 electric locomotives.

Erie R. R., Rochester, N. Y., 6 motor cars.

Long Island R. R., Long Island City, N. Y., 219 motor cars.

N. Y. C. & H. R. R., 35 electric locomotives, 125 motor cars, 55 trail cars.

New York, New Haven & Hartford R. R., 35 electric locomotives.

West Jersey and Sea Shore R. R., 87 motor cars.

There are in the state of Ohio 2,500 miles of trolley line in operation and in the state of Indiana 1,000 miles; in the matter of mileage, Ohio is probably the greatest trolley state in the Union, but Indiana has the honor of having the greatest trolley center at Indianapolis, where trolley lines diverge to all parts of the state.

Indiana has by far the best trolley systems, the latest developments in equipment and cars which embody the latest improvements in motor equipment, control arrangement and trolley and electric distribution of current, both as to direct current, single-phase, and high-voltage motors. Indianapolis as a trolley center certainly exemplifies the progress made in trolley and interurban systems better than any other system in the country, and a better place to study the development of the interurban business cannot be found. It has the most perfect terminal facilities of any city in the country, including freight yards, freight houses and a passenger station and terminal building that, certainly, any steam railroad might well be proud of. Twelve trolley lines center in Indianapolis and they carried in and out of that city last year more than 5,000,000 passengers and more than 100,000 tons of freight; and over 200 trolley passenger cars or trolley trains arrive and over 200 depart daily from their terminal station, affording the most convenient facilities for reaching almost any part of the state for passengers and freight.

On many of the lines express or limited cars are run which carry passengers through at high speed to destination, radiating from 100 to 150 miles from Indianapolis as a center. There is also an ample number of trains which take care of the short haul passenger business between the smaller towns.

TEST OF CAR FENDERS AT SCHENECTADY

The first series of tests in the car-fender competition held under the auspices of the New York Public Service Commission was begun at the Schenectady works of the General Electric Company September 15th. William McCarroll, commissioner for the First District, and J. E. Sague of the Second District commission were present with a number of the members of the engineering staffs of both public-service commissions, and several of the General Electric Company's engineering force. Bion J. Arnold, George Weston, Harvey B. Fleming and John Z. Murphy of the Board of Supervising Engineers, Chicago Traction, were among the prominent engineers in attendance. Chairman William R. Willcox and Commissioner Milo R. Maltbie of the First District were present the second day, and during the two weeks or more of the tests at least one of the commission arranged to be in attendance.

New York pavement conditions of asphalt and cobblestone were reproduced on the test track and dummies representing boys weighing 50 pounds, women weighing 120 pounds, and men weighing 170 pounds, were placed upon the track in various attitudes and run into by the car with the fender in position. The tests were conducted at various speeds and the engineers of the commission kept careful score of each test. An official photographer took photographs of dummy and car after the former had been struck and the car brought to a standstill. Four credit marks were used to keep the official record, as follows: "A," counting four points, for a complete pick-up; "B," counting three points, for a partial pick-up, with any part of dummy remaining under fender; "C," counting two points, for a partial pick-up, but with the dummy for the most part under the fender; "D," counting one point, where no pick-up is made and when the dummy is entirely under the fender but dragged sufficiently to prevent its going under the car.

As an example of the method of conducting the tests it may be mentioned that the first fender to be tried was that of the projecting automatic type manufactured by John O'Leary of Cohoes, N. Y. The fender was attached to a 25-ton trolley car provided by the General Electric Company.

In the first series on cobblestones at 15 miles an hour, the O'Leary fender received four "A's," one "C" and one "D." In the same series on cobblestone at six miles an hour it received three "A's," one "B" and two "D's."

Its operation in picking up a boy dummy is shown in an accompanying photograph taken during the first day's test.

The work of the second day, Wednesday, included the test of a wheel guard devised by James D. Wright and presented with the aid of L. S. Clark of Brooklyn. As shown in the reproduction of an official photograph, the fender consists of a basket-shaped scoop which is normally raised when the car is in motion, but is released to fall into operative position by a swinging dashboard which hangs from the front of the car and strikes the body. In many of the tests the fender acted as intended and the inventor said that in the instances where it failed the framework was not strong enough to withstand the impact.

Following the Wright-Clark wheel-guard tests the Rogan fender, entered by Clark, Raymond & Coale of Boston, was tested. When the metallic lattice work extending in front of the car is struck by an object on the track the fender is pushed backward so that the hinge changes and the front part drops to the track, the theory being that it will thus prevent a body going under the wheels and will carry it along the track until the car stops.

Next in order came the Seeley automatic wheel-guard, the test of which consumed the early afternoon. This device is based on a principle similar to that of the Wright-Clark wheel guard, in that the fender basket directly in front of the wheels and underneath the car is dropped when a leather buffer at the front of the car touches a body. The leather buffer rises and passes over the body, while the fender basket is supposed to drop and prevent its going under the wheels, also carrying it until the car stops. This guard was invented by Frank A. Seeley of New York.

Other fenders entered for the tests were those of Meeker & Co., the Mercier Consolidated Car Fender Company, M. Hirsch, H. F. Heide, J. P. Geraghty, Parmenter Fender Company, the Stirling, the Worcester Railway and Supply Company, W. H. Quin, the Weeden Automatic Car Fender Company and the Charles H. Wood Company.

A. W. McLimont, electrical engineer of the First District commission, was in charge of tests. Associated with him were his fellow members of the committee on safety devices; Daniel L. Turner, chief of the transit inspection bureau, and George F. Daggett, chief of the bureau of accidents.

Boy Dummy Picked Up by O'Leary Fender on Asphalt-paved Track

Boy Dummy Picked Up by Wright-Clark Wheel Guard on Cobble-paved Track

PUBLIC SERVICE COMMISSION'S FENDER TESTS AT SCHENECTADY

PROPOSED EEL RIVER DEVELOPMENT

A number of capitalists of Indiana have closed a deal for the Steiner land at Cataract, Owen County, on Eel River, near Coal City, Ind. The total purchase price for the land was $169,000. A dam 50 feet high and estimated to cost $150,000 will be built just above the lower falls, which will make a reservoir between the two falls covering 600 acres. Power houses will be erected at the lower falls, and one of the largest electric power plants in the state will be established. An electric railway from Indianapolis will cross the top of the dam and go to Brazil. It is asserted that the proposed plant will have sufficient capacity to generate electricity to light every town in that part of the state. Warren Meek of Coal City is a principal in the enterprise.

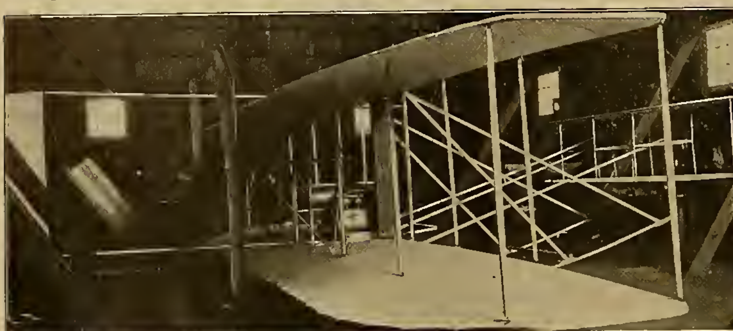
THE WRIGHT AEROPLANE AND WIRELESS COMMUNICATION

By Frank L. Perry

Part III.

The Wrights—The Men

At the center of the world's stage today now stand "the mysterious Wrights," Orville and Wilbur, thus dubbed by an unthinking people, because these gentlemen, apparently early recognizing in all its fullness a lamentable trait only too common among American machine designers and inventors, have all along absolutely, but most politely, refused to reveal through the newspapers and other sources of publicity their private business.

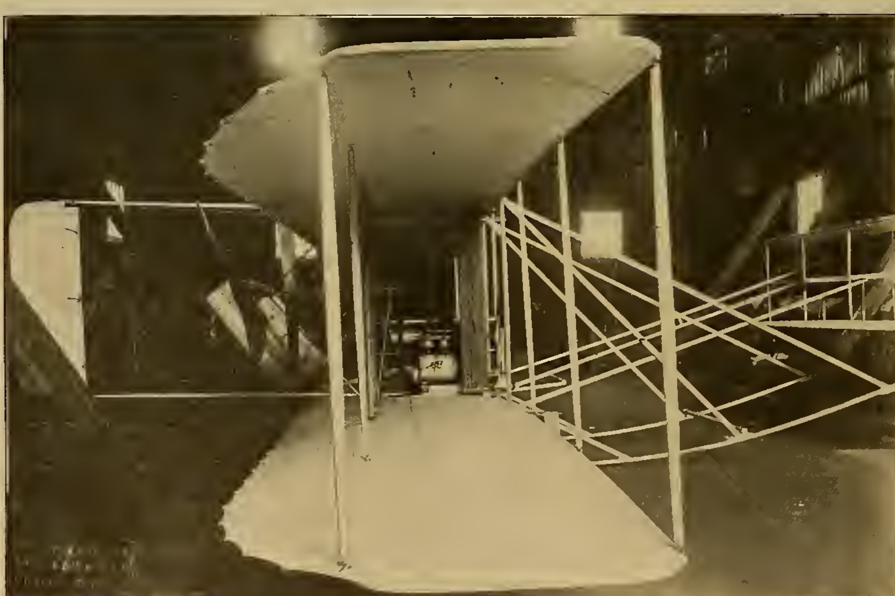


Copyright, 1908, by Waldon Fawcett, Washington, D. C.
FIG. 9. VIEW LOOKING TOWARD FRONT HORIZONTAL RUDDER OF AEROPLANE

Copyright, 1908 by Waldon Fawcett, Washington, D. C.
FIG. 11. VIEW LOOKING TOWARD REAR OF THE AEROPLANE AND TOWARD REAR VERTICAL-PLANE RUDDER

At Fort Myer Orville Wright showed himself to be modest, quiet, unassuming, but thoroughly self-possessed. As a man, he seems "right on to his daring job," as one newspaper man put it; and he gives the impression that he not only knows his business, but especially his aeroplane. He is a quiet man, reserved but evidently of tremendous latent nervous energy and determination; he is a young man, distinctly not of the "flying-machine-inventor" type. Dark, slender, blue-eyed, he is easy to approach, and during the tests at Fort Myer he gave conclusive evidence of his remarkable poise. His display of patience under the unthinking public's merciless verbal bombardment was remarkable. Mr. Orville Wright is a scientist, not a showman, and the majority of those who daily pestered him did not seem at all to appreciate this fact.

Mr. Orville Wright states that he himself is a nervous man. "Oh," he remarked to the writer while in conversation at the balloon house at Fort Myer, "I'm not suited for the operative part of this business. I am too nervous to be a good aviator. What is needed for an aeroplane is the sort of man that could drive an automobile at 90 miles an hour."



Copyright, 1908, by Waldon Fawcett, Washington, D. C.
FIG. 10. VIEW LOOKING INTO RIGHT SIDE OF AEROPLANE

But in spite of Mr. Wright's derogatory opinion of his own nerves, his coolness when before the public, one indication of which is his sustained courtesy to the general public and his employes, and his absolute command of himself during his manipulations of the aeroplane all tell a different story.

[This was written before the sad accident of September 17th, when Lieutenant Thomas E. Selfridge, Signal Corps, U. S. A., was killed and Mr. Orville Wright severely injured by the fall of the aeroplane at Fort Myer. The men were making a two-man flight when, according to the daily papers, a propeller blade snapped off, and hitting some other part of the mechanism, caused the airship to overturn and fall to the ground.—Ed. W. E.]

The Aeroplane Itself

In order to appreciate the many mechanical subtleties of the Wright aeroplane a close inspection of the accompanying illustrations will be necessary.

At first glance one is tremendously surprised at what seems not only to be the remarkable simplicity of the device, but as well its sturdy, substantial construction. There is a remarkable absence of what might be called mechanical "gewgaws," which a layman might think would be necessary in a machine of such wonderful character.

The only revolving parts constitute the power equipment; the rudders and planes, so to speak, are either hinged or flexible.

Generally speaking, the Wright aeroplane may be described as in the main two parallel plane surfaces mounted one above the other, as indicated in the pictures, and provided on the front with a sort of a rudder horizontally disposed, and this, too, is made of two surfaces. In the rear of the machine, to the left in the pictures, Figs. 9, 10 and 11, is also a vertical rudder, also made up of two parallel plane surfaces. These two fore-and-aft rudders are pivoted along their planes at points so that they are almost balanced, and therefore can easily be swung by the two control levers at the command of the operator. The machine is provided with two propellers located symmetrically, one on each side of the center line of the machine and just behind the rear edges of the two large main aeroplane surfaces. An important point is that these two propellers are so geared to the engine (see Figs. 12 and 13) that they run in opposite directions and thus act, in a way, to assist in the balancing of the machine.

Doubtless, too, there is in the rapidly revolving flywheel of the gasoline engine and the propeller blades, a certain gyroscopic effect that helps somewhat to maintain the aeroplane on an even keel when these parts are in rapid revolution.

The method of connection from the gasoline-motor shaft to the propellers is direct by chain drive; metal piping surrounds the chain belts so as to prevent any interference between the crossed chains. The motor is securely mounted on the lower of the two main planes. The vertical flat piping reaching from plane to plane, and seen to the left alongside the motor, is the radiator or water cooler, consisting of a number of small flat tubes.

As will be seen from the side views of the aeroplane, it is mounted on two wooden skids, reminding one very much of sleigh runners. These runners project forward and also beneath the aeroplane proper, and are utilized as a support for the front horizontal rudder. The whole forward structure is strongly braced with wooden struts and a specially tempered, tough tie-wire.

The rough dimensions of the machine are about as follows: The main planes are about 40 feet long by 6½ feet wide. These have a space between them of about six feet. It is estimated that the supporting surface is about 500 square feet. The horizontal rudder planes shown to the right in the pictures are each about 16 feet long by 2½ feet wide, and are shaped each on both its ends to a sort of point. The total surface in these two planes figures out to about 75 square feet. Standing alone without aviator or other added weight, the aeroplane weighs about 800 pounds. With the aviator and one additional passenger, together with a supply of fuel and water, it is estimated that the weight would be in all about 1,150 pounds.

Gasoline Engine

The Wright brothers have designed their own engine for this aeroplane. Generally speaking, it

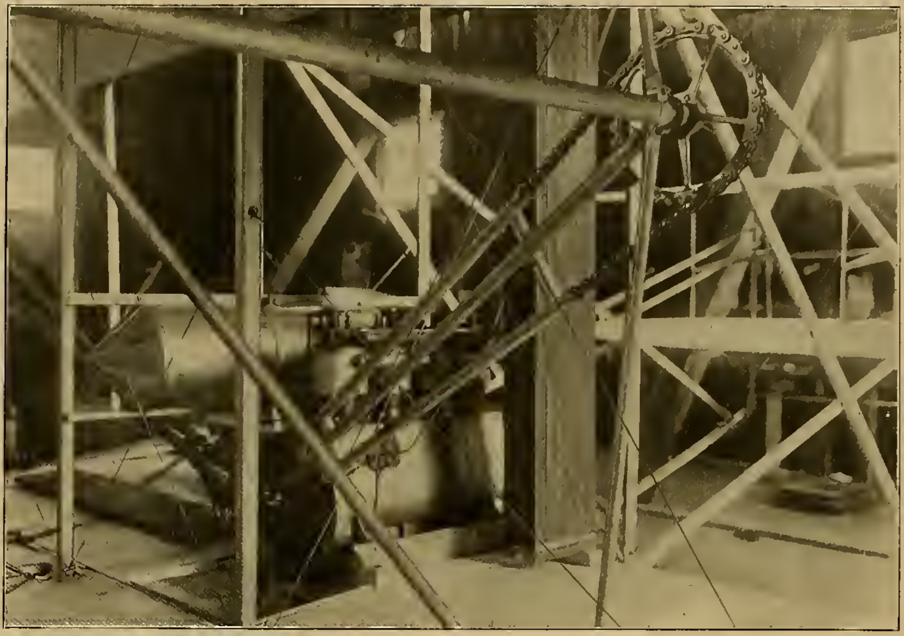
Copyright, 1908, by Waldon Fawcett, Washington, D. C.
FIG. 14. BACK VERTICAL-PLANE RUDDER

is a vertical four-cylindered, water-cooled gasoline motor, planned to be run at a constant speed of about 1,400 revolutions per minute. It is understood that it is so geared that at this speed it will drive the propellers, which are from six to eight feet in diameter, at about 500 revolutions per minute. Mr. Wright uses no carbureter, but draws his gasoline into the cylinders above the inlet valves.

Some assert that this method of operating a motor without a carbureter and by feeding gasoline direct to the cylinders, although not economical in fuel, produces the best results for a motor that has to be run at a constant speed, as does this aeroplane engine. It is further understood that Mr. Wright's practice is not to change the speed of the motor at all after once it is in action, except to stop the machine.

The Wright aeroplane engine is placed with its shaft in a fore-and-aft direction on the lower plane. It is located along the side of the aeroplane's fore-and-aft center line, with the aviator and passenger on board (these two men being located as shown in Fig. 12 on the two cushioned seats in this picture to the right of the engine), so that the load around this center line is quite symmetrically disposed, and thus practically in balance.

Gasoline-engine people will be interested to know that Mr. Wright uses no spark plug in his Fort Myer aeroplane, but operates with a make-and-break spark from a small magneto nestling at the back end and right close to the engine on the aeroplane. Roughly speaking, he figures the engine on this aeroplane at about 32½ horsepower, with the engine at 1,400 revolutions and the propellers geared down to about one-third speed.



Copyright, 1908, by Waldon Fawcett, Washington, D. C.

This Shows Gasoline Engine, Gasoline Tank and Chain Gearing to Propellers

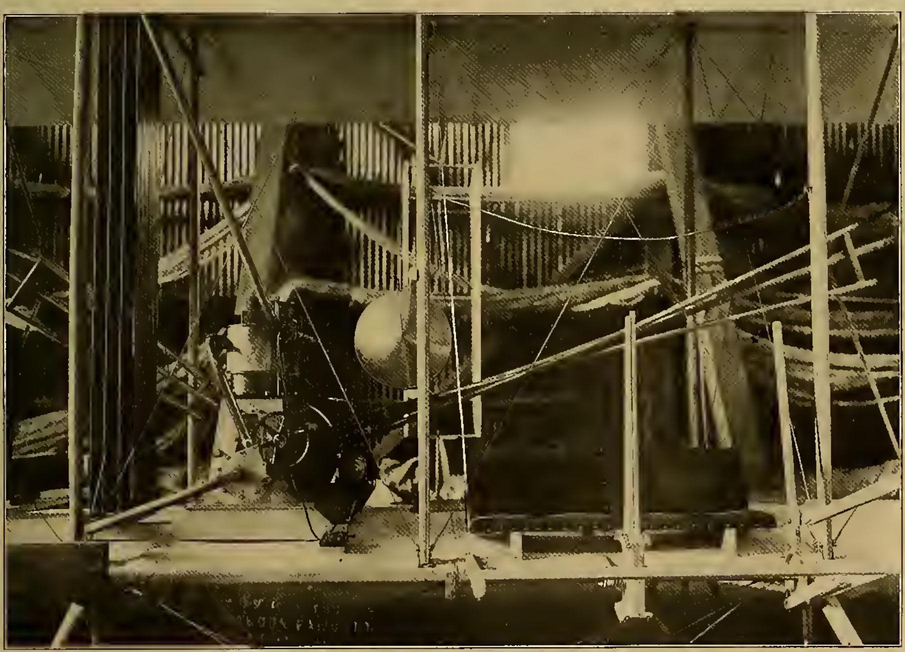
FIG. 13. VIEW LOOKING DIAGONALLY FORWARD TOWARD FORWARD RUDDER

Method of Control

The reader's attention is called particularly to Fig. 12. In the lower right-hand corner of this picture will be seen the aviator's seat; it is to the extreme right, in the photograph, but at the aviator's left hand, and when in position the operator appears as seated between one lever at his left hand and two levers at his right, which may be operated together or separately. Facing the picture, to the left of the operator's seat, is the seat for the passenger. These two men, therefore, face to the front and with the engine at their right hands. There is a sort of a brace across the framework in front of both aviator and passenger, upon which their feet may rest, all of which gives the aviator particularly, a purchase and enables him the better to command his levers.

The one lever at the left hand of the operator controls the angle of the two parallel horizontal rudder planes at the front of the aeroplane. The twin levers closely adjacent each to the other at the right hand of the operator, are in control, respectively, of the machine's plane-warping mechanism, and also the vertical double-plane rudder at the rear. The office of these three levers will be referred to more in detail in the explanation relative to how the machine flies.

The reader should appreciate that these three levers and the stop cock on the engine, which is for the simple purpose of controlling the fuel, are all that the aviator has to manipulate during a flight. But upon the skill, the dexterity and the quickness with which these four parts are handled, hang the operator's success, and it is no exaggeration to say, sometimes his life.



Copyright, 1908, by Waldon Fawcett, Washington, D. C.

Controlling Levers and Seats for Aviator and Passenger are Shown

FIG. 12. VIEW LOOKING TOWARD REAR RUDDER OF AEROPLANE

A point to be remembered, too, in studying this machine, as has been repeatedly explained by Mr. Orville Wright, is that the speed of the aeroplane is varied chiefly by the changes in the angle of the aeroplane's lateral surfaces and not by varying the speed of the motor.

Details of Construction

The framework of the aeroplane is constructed of wood and a very tough sort of tie-wire, where tensional stresses are involved, made especially for the Wrights. Another beautiful feature of the machine's construction lies in the fact that the unbleached muslin used for the aeroplane's surfaces is stretched on the aerplane's framework on both sides and on the bias.

At first glance it would appear almost as though the designer had been careless relative to reducing what would be supposed to be a considerable air-resistance in the machine. The various parts look almost too strong and sturdy. But it is understood that after exhaustive experiment Mr. Wright found the oval form and comparatively heavy wooden struts used were highly efficient in their lack of air resistance.

The main features claimed by the Wrights for their aeroplane are its exceedingly great simplicity and remarkable efficiency, compared with other work now on record along the same line.

One part of the machine relative to which there has been much study and research on the part of the Wrights is their propellers. These are of wood and especially curved according to exhaustive tables calculated by the Wrights to obtain the maximum efficiency in air at a given speed.

Delicate Control Necessary

It should be distinctly understood that the Wrights do not claim for their machine that it is in the least automatic, but it is, on the contrary, man-controlled, so to speak. A successful flight in the Wright aeroplane is accomplished entirely through the operator's control of the machine by handling the source of power, and, once in the air, by the manipulation of the three levers shown, one to the left and two to the right of the aviator as he sits in the aeroplane.

It should be borne in mind, too, that the man who attempts a flight in this machine subjects himself to the possibility of a serious happening from a false movement of any one lever, and failure, particularly, to handle properly the one lever at the left of the aviator. This controls the angle of the surfaces of the horizontal rudder, and a wrong movement might in an instant plunge the whole machine to the ground similar to a darting

Copyright, 1908, by Waldon Fawcett, Washington, D. C.

Inclining this Rudder Sends the Aeroplane Up or Down

FIG. 15. FRONT HORIZONTAL-PLANE RUDDER

[*Continued on page 230.*]

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

THE ILLINOIS CENTRAL Railroad Company has promised to investigate the subject of electrifying its Chicago terminal. That is good as far as it goes. But inasmuch as the subject has been under consideration by the management of the road for 15 years, more or less, some hint of performance would be more satisfactory than the assurance of a new investigation. The aroused citizens of Chicago will do well not to drop their agitation for the abolition of the steam-locomotive nuisance, but to continue their organizations and their efforts with wary and watchful attention.

PARIS may have a poor telephone system, but it realizes very keenly, nevertheless, as the result of the recent fire in the main exchange, what it means to be without this modern convenience which has come to be a virtual necessity. In addition to the total interruption of the telephonic service between Paris and the provinces and foreign points, the Department of Posts announced on September 21st that the flames had destroyed also a large number of the long-distance telegraph wires. Consequently the telegraph service to England, Belgium, Austria, the northern part of France and the suburbs of Paris was seriously affected, and it was impossible at first to handle the business offered. Says an Associated Press dispatch of the date mentioned: "The partial paralyzation of these essential methods of communication is causing immense damage to the multitudinous business activities in France itself and between France and foreign countries, and the resultant financial loss will be tremendous."

We may execrate poor telephone service with curses loud and deep, but if the pinch should come, and this door of communication should be entirely deaf to our knock, we should experience a sense of helplessness which the business men of 35 years ago would be totally at a loss to understand. The daring innovations of one generation become the necessities of the next.

AERONAUTICS is now such a live subject that the question has been raised whether difficulty may be expected from the difference of potential of atmospheric electricity in operating balloons at considerable altitudes. A German writer who has paid some attention to the subject points out that since a potential of some 100,000 volts exists a mile above the earth's surface, it has been argued that a balloon must assume an enormous charge, which on landing might become dangerous. But in reality, he says, balloons are sufficiently conducting to adapt themselves to the varying potential of the medium. Their conductivity may be increased by painting them with chloride of lime, but this becomes ineffective after about an hour's sunshine. The real danger is thought to lie, not in the charge of the balloon as a whole, but in the different changes of its parts. These are sometimes greatly increased by the friction of the sand from the ballast against the car. A single bag may give rise to dangerous charges. The moment of landing is particularly dangerous, and the slitting of the envelope usually shows sparking in the dusk, according to the writer in question. These sparks are not dangerous unless a certain minimum capacity is discharged by them. The valve, having been insulated on the top of the envelope, must be carefully and gradually discharged on landing. Aeroplanes are operated so near the surface of the earth that the possible dangers of rapid changes of potential need not be taken into account.

ALTITUDE has an undoubted influence on the effective performance of gas engines, and the fact is of some interest and importance. Mr. J. R. Bibbins of Pittsburg, in a recent communication to the American Society of Mechanical Engineers, notes that although the customer is only interested in the capacity an engine will develop at his particular altitude, it is a fact that builders rating at sea level have an appreciable advantage over those rating at, say, 1,000 feet. He suggests that the standardization committee of the Gas Power Section of the society might insert a table or curve showing the theoretical decrease in engine capacity at different altitudes. This cannot, of course, be applied rigidly to all types of engines, as the effect of altitude differs somewhat, according to the design. In cases of very high altitude, however, as Mexico and the West, ratings would naturally be based on the altitude of the proposed installation. A comparison of records of the Weather Bureau shows that the variations in the barometric column due to local atmospheric disturbances are confined to a very definite range. The "power loss" curve drawn for an altitude of 750 feet will explain the statement made in regard to the difference between ratings at that height and those made at sea level. Similarly, a parallel curve drawn through the point of 1,000 feet altitude shows that a builder rating at this altitude furnishes an engine of four or five per cent. greater capacity when running at sea level than his tidewater competitor.

The point is one that may be easily overlooked; it should be borne in mind by buyers of gas engines for use at considerable altitudes.

ENGINEERS, or not a few of them at least, are beginning to think that they should take a more prominent part in public affairs. Lawyers, trained to influence their fellow men by argument, to think quickly and clearly on their feet in unforeseen contingencies and to speak fluently in public, have almost monopolized the important positions in public life in the United States. All four of the candidates for president and vice-president of the two great parties in the present political campaign, for instance, are men who have been admitted to the bar. A prominent mining engineer was mentioned for the vice-presidential nomination of one of these parties, and the suggestion caused some surprise. In Chicago a leading physician is president of the Municipal Voters' League, but this fact is exceptional. How many doctors or engineers or educators are there in Congress? Undoubtedly the proportion is very small.

Dealing with men as well as with things, the engineer's broad outlook, his practical constructive ability and his resourcefulness in bringing things to pass should make his services valuable in the legislative and executive departments of the nation and the various states. When the digging of the Panama Canal was placed in charge of the army engineers—engineers pure and simple—it became a conspicuous success, although large problems of administration were involved.

But the engineer has been retiring. He has given his attention to purely professional work and has rather looked down upon politics and politicians. Then, too, the rewards he has received for his exertions have been larger than the usual salaries attached to public office.

In an industrial age, however, new problems, like those relating to public utilities, have come up, and here the engineer's qualifications should be particularly in demand. It is far from flattering to observe not only how infrequently engineers are elected or appointed to public office, but how seldom they are named on public commissions having tasks which their training particularly fits them to execute well. In the language of Mr. Charles F. Lacombe, "In a way business men and other professions seem to regard the engineer in the light of an expert only, in a limited field, and that beyond this he has had little experience and has little knowledge of the affairs of the world at large, with which they think they are more closely in touch."

It remains for the engineer himself to correct this false impression if he chooses to do so. To do this he must take some time and effort from his professional duties and apply them to his rights and privileges as a citizen. He should not shrink from being known as "active in politics," if it is the right kind of politics. Lawyers are so active, and engineers may well take a leaf from the lawyers' book if they wish similar prominence in public matters. Many there be who think the game not worth the candle, but signs are not lacking that others are disquieted by the non-activity of engineers in the administration of state and national affairs.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES

On September 15th, 16th and 17th was held the twenty-fourth annual meeting of the Association of Edison Illuminating Companies. The sessions were held in the spacious halls of the Hotel Aspinwall at Lenox, Mass., and were exceptionally well attended by representatives from the largest central stations in the country. A large number of ladies were the guests of the association and the entertainment features provided for their special benefit as well as those arranged for all persons present were particularly pleasant and enjoyable.

The first session was called to order on Tuesday morning and was opened by the reading of the annual address of President Alex Dow of Detroit. Mr. Dow touched upon the most important topics that engrossed the attention of the convention. Referring to the financial stress of the past year he called attention to the experience as a modern instance of the law that fixed and standing charges are the large element in central-station expense; that a decrease of output does not proportionately decrease expenses, and that (conversely) an increase of output which can be served by an existing investment does not proportionately increase expenses. He said the illustration of the rule was such as will not soon be forgotten, and he hoped may not be repeated.

"It is clear," he declared, "that in our efforts to minimize fixed and standing charges we must look for reductions of investment costs along every possible line. The possibilities of more compact buildings, of larger units of electric generating and steam-producing plant, of higher efficiencies of transmission and transformation have been well discussed. The feasibility of cheaper underground construction has had our attention at several meetings. The requirement that the expense of connecting each individual customer shall be reduced has been insisted upon at a recent meeting and arises again at this meeting in connection with the consideration of cost of meters. It has even been suggested that we are in the habit of paying too much for reliability of service. Some other lines of inquiry deserve attention, as follows:

"Is is possible that the new metallic-filament lamps may permit a lower standard of potential regulation than we have heretofore held to be necessary? Our standard two per cent. variation of pressure in mains costs much money for copper in mains and for frequent feeders, or transformers, as the case may be. The effect of small differences of potential upon the brilliancy and life of the carbon-filament lamp is the occasion for this investment. Will the metal-filament lamps, much less responsive to variations of pressure, practically permit a greater range? Motors and arc lamps give satisfactory service where the fluctuation is twice that which can be tolerated in carbon-filament incandescent lamps. Will the new lamps warrant us, in time, in adopting a four or six per cent. standard of regulation?

"In the matter of sales of factory power, can we establish a class of service sufficiently reliable to be commercially acceptable and yet requiring less investment and less line maintenance than is now our standard? Is there not a possibility of distributing by overhead lines, at comparatively high voltages, alternating-current power regulated closely as to frequency but not over closely as to voltage, so that there may be a minimum of copper and of sub-station investment; this power contracted to be delivered only during ordinary factory hours, so that during evenings and holidays and Sundays the high-voltage lines may be shut down to permit of maintenance work and new connections? Our theory has heretofore required 24 hours' continuous service, and a regulation, even on factory circuits, good enough for our incandescent lighting—a much higher standard of regulation than is to be found in a plant which a factory owner operates for his own use. The factory owner makes his repairs nights and Sundays. Does not continuous 24-hour service for this class of business increase our investment to a point which is not warranted by the commercial conditions?

"For those of us who generate or purchase current at low frequency, converting or transforming it before distribution, is it not probable that there is some commercially possible relief from the fixed and standing charges required by the conversion or transformation—the cost of sub-station apparatus and the attendance thereof? Power distribution at 25 cycles is already accepted. Light distribution at 25 cycles is not yet accepted, but recent experience of our members shows that 25-cycle distribution is partially possible and that 30-cycle distribution is entirely so. Is it not exceedingly desirable that there should be a determination of all the possibilities in this line? Does not the possible advantage warrant our study?

"During the last 12 months the tungsten lamp has been fairly placed on the market, and it must now be accepted as a commercial product. So far, and naturally, its development has been along the lines which seemed good to the manufacturers, and the position of our association, representing the most important central-station interests in the country, has been that of an interested student and experimenter. I think that we have now reached the time where a definite commercial policy as to tungsten lamps can be adopted by our members; that the figures to be placed before you by the lamp committee will serve as the basis for the formulation of such a policy; that, in fact, our companies should presently be able to offer a tungsten lamp to their customers on terms which will be attractive to the customers and will yet preserve to us a reasonable return for our service and investment. It seems to me no longer necessary that a central-station company should assist the introduction of the new lamp by sacrificing two-thirds of the income from its incandescent lighting business to the end that the customer may get the advantage from the reduction in current consumption and the lamp manufacturers may make a large profit. The stage when the large profit to the lampmaker was essential has, I think, been passed.

W. W. FREEMAN,
President of the Edison Association

"Not only the lamp committee but the other standing committees of the association present reports of great interest and of a character, with one exception, inviting discussion. The new committee on high-potential disturbances makes its first report and amply justifies its existence and continuation. The exceptional report which does not call for discussion is that of the committee on storage batteries. The work of that committee since its reestablishment has been to determine completely and with precision every question arising in storage-battery practice and the annual reports have been statements of indisputable conclusions—not merely statements of opinion admitting of argument."

Following the president's address a number of committees' and officers' reports were presented. These included a report of the executive committee, by W. W. Freeman of Brooklyn, secretary of the association; treasurer's report, by Louis A. Ferguson of Chicago; report of committee on meters, by J. W. Cowles of Boston, chairman; committee on electric heating, by John F. Gilchrist of Chicago, chairman; committee on storage batteries, by Louis A. Ferguson, chairman, and committee on National Code, by William C. L. Eglin of Philadelphia, chairman.

Papers were also read on "A Review of the Policies Pursued by Edison Companies in Handling Incandescent Lamps," by Preston S. Millar of New York; "Measurements with Portable Testing Instruments," by F. P. Cox of Lynn, Mass., and on "A Study of Residence Lighting," by two representatives from the Detroit company. The two last-named papers will appear in slightly condensed form in future issues of the Western Electrician.

Tuesday evening's session was devoted to lamp discussions. First, there was presented the report of the committee on incandescent lamps by J. W. Lieb, Jr., of New York, chairman. This was followed by an informal talk on "Recent Developments in Metal Filament Lamps," by John W. Howell of Harrison, N. J., and the reading of two papers on "Probable Effects of the Higher Efficiency Lamp on Central-station Income," by E. F. Tweedy of New York, and "A Self-supporting Tungsten-lamp Campaign," by M. S. Seelman, Jr., of Brooklyn.

Problems relating to the steam plant took up most of Wednesday morning's program. The report of the committee on steam turbines was read by its chairman, Charles N. Parker of Boston. Papers were presented as follows: "The Operation of the Boiler Plant and Cost of Making Steam," by J. P. Sparrow of New York; "Supplementary to 1907 Paper on Steam Heating from Central Stations," by B. R. Fales of Detroit; "Modern Sub-station Apparatus," by E. M. Allen of Schenectady, N. Y.; "Single versus Three-phase Transformers for Distribution Purposes," by L. L. Elden of Boston, and "Short Circuits on Alternators," by E. J. Berg of Schenectady, N. Y.

In the evening the report of the committee on high-potential disturbances was submitted by W. F. Wells of Brooklyn, chairman. Following this came that interesting feature without which no electrical convention is wholly complete, and that is a lecture by Dr. Charles P. Steinmetz, who took as his subject "Electrical Engineering Problems of the Future." This lecture was followed with the closest attention and created a profound impression on all who heard it, as the speaker gave free rein for the first time in a large gathering to his opinions on the electrical outlook for the future.

The concluding session on Thursday was given to the reading of the last papers on the program. These were: "Some Advertising Notes with Particular Reference to the Advertising Value of the Display Room," by H. K. Mohr of Philadelphia; "Status of the Special Customer," by James V. Oxtoby of Detroit, and "Compensation to Injured Employes—Plan of the New York Edison Company," by E. M. Atkin and H. M. Edwards of New York. This was followed by an interesting talk on "Lighting in Europe," by Dr. Louis Bell of Boston. The final business of the meeting was the election of officers, which resulted in the choice of the following-named gentlemen:

President—W. W. Freeman, Brooklyn, N. Y.

Vice-president—George H. Harries, Washington, D. C. (re-elected).

Secretary—D. L. Huntington, Spokane, Wash.

Treasurer—Louis A. Ferguson, Chicago, Ill. (re-elected).

The executive committee was practically re-elected. It consists of these four officers as ex-officio members besides Samuel Insull of Chicago, Joseph B. McCall of Philadelphia, John W. Lieb, Jr., of New York, Charles L. Edgar of Boston and Thomas E. Murray of New York.

STATE-OWNED ELECTRIC RAILWAY PROPOSED

The state of Texas may try the experiment of building and owning an electric railway. It will be the first state in the Union, it is said, to do this. The initial project has the support of Governor Campbell, and it is expected that it will receive the indorsement of the Legislature, which body will be asked at its coming session to make an appropriation for building and equipping the line. The railway is to run between the town of Bryan and the State Agricultural and Mechanical College. It will be about seven miles long. The situation which suggested the building of this railway is the crowded condition of the college dormitories. Either an appropriation of not less than $150,000 will have to be made by the Legislature to erect additional buildings upon the grounds of the institution for the accommodation of the students or provision must be made for taking care of them away from the college. There are many boarding houses at Bryan where students can be accommodated if connection is had with the college by means of an electric railway. It is estimated that it will cost the state about $100,000 to build and equip the railway and that it can be operated at a considerable profit on the investment. It is planned to transport the students and members of the faculty of the college at a reduced rate of fare. The line will also be used to haul freight and supplies for the institution.

GREAT IRRIGATION PROJECT FOR MEXICO

An order for electrical machinery to the amount of $3,750,000 gold, just placed by Manuel Cuesta Gallardo of Guadalajara, Mexico, with a German manufacturing concern, is said to be the largest single order for equipment of this character ever sent to Europe from Mexico. The contract for the purchase of this machinery is backed by the Mexican government, which has granted to Gallardo and his associates a concession for the irrigation of about 500,000 acres of land, situated in the state of Jalisco, adjacent to Lake Chapala, from which the water supply for the purpose will be obtained. Under the new irrigation law the government will pay Mr. Gallardo and associates a subsidy of $25 for every acre of land which they bring under irrigation. The proposed electric plant will provide the power for operating the irrigation pumps in this big project.

The plans, which have already received the sanction of the federal authorities, call for the development of about 70,000 horsepower by hydro-electric plants. The larger of these plants will be situated in the canyon of the Santiago River, a short distance from Guadalajara. The water will be diverted from the river by means of a canal and a fall of about 1,400 feet obtained. This waterfall will be capable of generating about 60,000 horsepower. The other hydro-electric plant will also be located upon the Santiago River, about 15 miles from Guadalajara. It will have a capacity of about 9,000 horsepower. Three irrigation pumping stations will be installed at once at Ocotlan, Pencitlan and Zula, and four more similar stations are planned later on.

In addition to providing power for these pumping plants, transmission lines will be built to the city of Aguas Calientes, about 200 miles distant; to Guadalajara and to Etzatlan and other mining districts situated in remote parts of the state. It is reported that ex-Governor David R. Francis of St. Louis, Mo., is one of the Americans who are associated with Mr. Gallardo in this enterprise. Mr. Francis and his representatives made a thorough investigation of the project a few months ago. About half a million acres of land will be brought under cultivation.

THE WRIGHT AEROPLANE AND WIRELESS COMMUNICATION

[*Continued from page 227.*]

kite, or, under certain circumstances it is conceivable that the machine might turn backward.

An interesting feature often emphasized by Mr. Wright, particularly during his preparation for the Fort Myer flights, relative to operation, was that the rear vertical rudder was never used alone for changing the direction of the machine. The real office of this rear rudder will be explained in the portion of this description relative to how the machine flies. To the credit of the machine, however, should be placed Mr. Wright's unequivocal statement that he has every confidence that he can in a few weeks teach any man of good intelligence and a fair amount of self-possession and nerve, easily to fly in his aeroplane, and with very nearly perfect safety, providing the man is of fairly conservative temperament and not inclined to take risks for the sport of the thing.

Fig. 14 is a closer view of the construction of the rear vertical so-called rudder planes, while Fig. 15 is a view, likewise more in detail, of the two forward horizontal rudder planes that are manipulated to keep the machine on fore-and-aft even keel.

And right here, it should also be stated in brief. that the sidewise balance of the machine is maintained through the warping of the two main aeroplane surfaces at their outer ends. This will afterward be more fully explained.

[*To be concluded.*]

Mr. Henry E. Huntington of California considers the great system of railways he is building on the Pacific Coast as his monument. "Before I entered upon this work of building electric railways in Southern California I formulated a complete plan," said Mr. Huntington recently. "I expect to build electric railways in Southern California as long as I live, and I hope to live a great many years. Southern California is still in swaddling clothes and you may carry the simile to the Pacific electric and interurban systems."

PITTSBURG SECTION OF THE INSTITUTE

The September meeting of the Pittsburg Section of the American Institute of Electrical Engineers was held in the lecture hall of the Carnegie Institute. Besides the reading of the papers, the following-named officers were elected for the ensuing year: Chairman, W. Edgar Reed; secretary, B. P. Rowe; executive committee, C. B. Auel, B. Rutherford, F. Uhlenhaut, Jr., C. W. Davis, E. B. Tuttle, Ludwig Hommel.

Mr. Reed has had a broad experience in electrical engineering, both in France and in America.

F. D. Newbury abstracted J. L. Woodbridge's paper on "The Application of Storage Batteries to the Regulation of Alternating-current Systems." He explained how batteries were used in connection with rotary converters having two-part, split pole-pieces, and also rotary converters having three-part pole-pieces.

L. H. Flanders read a paper on the "Relay Type of Load Regulators for Storage-battery Systems." He explained by diagrams how beautifully a relay can be used, together with a battery, to regulate the supply of alternating current through a rotary converter to produce a satisfactory supply of direct current.

P. M. Lincoln said that the idea carried in all electrical engineers' minds was that the ratio of the direct current to alternating current in a rotary converter was fixed, being for two-phase 1 to 0.7 and for three-phase 1 to 0.6. These ratios do not hold exactly, and it has been known that by trimming the pole-pieces and giving the proper back charge the ratios could be modified. Mr. Lincoln believed it original with Mr. Woodbridge to change the field form in order to change the alternating-current and direct-current ratio. The two-part-pole-piece rotary has the advantage of combining the functions of a rotary and regulator. The disadvantages are that it will probably be more expensive, have a distorted wave form; power factor cannot be made unity; conditions are favorable for resonance with large cable systems, and also favorable for hunting.

J. L. Davis discussed Mr. Fessenden's paper on "Wireless Telephony." He explained how the energy began to flow out into space from the antenna harp when the frequency became 85,000 and from that on to 100,000 the energy radiated increased from zero per cent. to nearly 100 per cent. He also explained the design of a high-frequency generator, the arrangement of Poulsen's arc and the marginal method of tuning invented by Fessenden.

E. B. Tuttle spoke of the method of relaying telephone messages from wire lines to wireless transmitters, and vice versa.

S. P. Grace, in the discussion, spoke of the progress made in telephony. He started with the first form of telephone, that of iron rods driven into the ground outside of forts to indicate to the defenders any attempt of an enemy to tunnel into the fort, and showed what rapid progress had been made in the art. He referred to some early letters on the invention of the telephone written by T. A. Edison to T. B. A. Davis.

ELECTRICAL INSPECTORS TO MEET IN CHICAGO

The fourth annual meeting of the Western Association of Electrical Inspectors will be held in the assembly room of the Chicago Board of Underwriters on October 20th to 22d. The sessions will begin at 10 o'clock each morning. Tuesday's meeting will be devoted to the address of President E. R. Townsend and to reports of the secretary, executive committee and committees on uniformity in rulings, National Code and on outside wiring. At Wednesday's session three special addresses will be made, the subjects being "Grain Elevator Wiring," by Charles Nutter of Topeka, Kan.; "Electrical Inspection from the Viewpoint of the Central Station," by William H. Blood, Jr., of Boston, and "The Underwriters' Laboratories and Its Work," by William H. Merrill of Chicago. In the afternoon the delegates will attend demonstration tests at the Underwriters' Laboratories, 382 East Ohio Street. The concluding session will be given up to the consideration of reports from the following committees: Grounding of conductors for safety, theater wiring and show equipment, public safety, architects' specifications, laws and ordinances, and finally the nominating committee. Following this will be the election of officers and a general discussion on difficulties arising in electrical inspection work. The convention will close with a banquet on Thursday evening.

STREET-RAILWAY FRANCHISES IN CANADA

The aldermen of the city of Calgary, Alberta, are negotiating with the Montreal Engineering Company of Montreal, Que., for the construction of an electric street-railway system, and with a view to obtaining the best agreement possible information regarding similar franchises has been obtained from the leading cities of Canada.

At Ottawa the street-railway company's 30-year franchise expires in 1923. The city receives $500 and $1,000 per annum for each mile of car line on unpaved and permanently paved streets, respectively, averaging from this source $15,000 each year.

The Toronto company pays $800 per mile for single and $1,600 for double track yearly, besides a percentage varying from eight per cent. to 20 per cent. of the gross receipts each year. The city of Winnipeg gets five per cent. annually of the gross street-railway receipts and $20 for each car run during the year. At Montreal the franchise granted the street-railway company gives the city the privilege of assuming the railway at a price to be set by a board of arbitration. The company pays an annual percentage of gross receipts to the city ranging from four per cent. on $1,000,000 to 15 per cent. above $3,000,000.

Vancouver, B. C., gets five per cent. of the gross street-railway profits, which this year will amount to about $20,000. The company has an agreement with its employes giving them a share of the profits each year.

CENTRAL ELECTRIC RAILWAY ASSOCIATION

The Central Electric Railway Association held its regular meeting in the Palm Room of the Claypool Hotel, Indianapolis, Thursday, September 24th. The program included a list of papers of unusual excellence and interest, and as this was the first meeting after the summer vacation many members and invited guests from Ohio, Indiana and Michigan were present. F. D. Carpenter is president of the association and A. L. Neereamer secretary.

A list of the papers read is given below:

"Recent Development of Lightning Arresters," by David B. Rushmore, engineer of the power and mining department of the General Electric Company, Schenectady, N. Y.; "Railroad Track Bracing," by Amos J. Coover, Dayton, Ohio; "The Mechanical Application of Wireless or Radio-telegraphy to Railroads," by Frederick H. Millener of Omaha, Neb.; "The Benefits of the Index Bureau," by E. C. Carpenter, claim adjuster of the Indiana Union Traction Company, Anderson, Ind.; "The Electric Railway Return Circuit," by E. G. Hindert, chief engineer of power of the Cleveland, Southwestern and Columbus Railway, Elyria, Ohio.

The afternoon session closed with a general discussion on the subjects of tariffs, concurrences and their filing, in which the members of the association took part.

CHICAGO N. E. L. A. BRANCH

The employes of the Commonwealth Edison Company of Chicago have been among the first to take advantage of the recent provision adopted by the National Electric Light Association for the formation of branches. Already the membership of this company branch has reached 260 and more are coming in. Besides the stated benefits enjoyed by Class B members of the association, it is the intention to add local interest to the branch by instituting frequent technical and social meetings in Chicago addressed by local engineers and electrical men.

Similar branches are being formed in various parts of the country by the employes of large central-station companies, but it is believed that the Commonwealth Edison's branch is much the largest in the field. No permanent officers will be elected until the first regular meeting of the Chicago branch is held at a date not yet set, but Mr. Homer E. Niesz of the company and manager of the Chicago Electrical Show is the temporary secretary during organization.

QUESTIONS AND ANSWERS

CONTROL OF ELECTRIC AUTOMOBILES

G. M., St. Paul, Minn.: How does the controller of an electric automobile work? Is it wired like that in a street car?

ANSWER

Controllers for electric automobiles are almost invariably much simpler than those for street cars. This is because the grouping of the storage battery can be made such as to get a number of voltages impressed on the motor, thus giving a number of speeds without the need of resistances in the armature or field circuits or of more than one motor for series parallel connection, although two motors with this connection are sometimes used.

Probably the simplest control is obtained by the use of one motor with 40 cells, which is the most common number of cells in the battery. These cells are grouped in four trays, each containing 10 cells permanently in series. The terminals of these trays are separately connected to contact fingers on the controller. The motor terminals are similarly connected. The controller drum connects the four sets of cells in parallel to the motor for the first speed, thus applying 20 volts to it. For the second speed two trays of cells are connected in series and two such sets in parallel, thus giving 40 volts. The third speed is obtained by connecting the four trays, i. e., all the cells, in series; this gives 80 volts. Each of these speeds is a running speed, since no resistances to become heated are used. Each cell of the battery gets equal service with others. Other connections of the controller are used when the battery consists of a different number of cells and when two motors are used, but in general the simple scheme outlined is followed closely.

SIZE OF HYDRO-ELECTRIC PLANT

C. A., Mattoon, Ill.: It is desired to install a hydro-electric plant to furnish current for 100 16-candlepower incandescent lamps and 10 five-horsepower electric motors. What capacity generator and hydraulic turbine would be required to operate the plant? Would not the 220-volt, three-wire system be best for distribution?

ANSWER

Assuming the lamps to be of the old carbon-filament style, the set would require about 7.4 horsepower for lighting and the motors 50 horsepower, thus requiring a generator of 60 horsepower. The turbine should be capable of developing 65 horsepower. If the lamps and motors are at some distance from the plant line losses must be provided for by making the generator and turbine larger by some five per cent. or more, depending on the distance. The three-wire system would be an excellent one to use, the motors being connected directly to the 220-volt mains and the lights between the neutral and either main. If the plant is very compact and near to the source of power, however, the saving of the three-wire over the two-wire system will be comparatively small.

TWENTY-MILE TRANSMISSION FOR 100 HORSEPOWER

The Famatina Development Corporation, which is interested in the development of copper mines near Chilecito, Argentine, is installing a hydro-electric plant, the generating equipment for which consists of two 200-kilowatt, 240-volt, revolving-field generators with direct-connected exciters, together with a suitable switchboard and transformers for stepping the voltage up to 13,200 volts. The generators are belt-connected to a line shaft driven by two four-foot Pelton wheels capable of developing 630 horsepower at 300 revolutions per minute. The head is 230 feet, the pipe line being 6,661 feet in length. There are also two sub-stations, one located at the smelter a short distance from the generating station and the other at the mines. Besides the apparatus mentioned above the General Electric Company also supplied several induction motors of various sizes for use both at the mines and at the smelter.

This installation, while comparatively small, is interesting from the fact that a 20-mile transmission line will be erected from the generating station to the mines for transmitting only 100 horsepower and ultimately twice this amount. The comparatively large expenditure is due to the scarcity of fuel.

THE ATLANTIC CITY STREET-RAILWAY CONVENTIONS

Preparations for the next annual convention of the American Street and Interurban Railway Association and its affiliated and allied associations are being rapidly completed. As previously announced, the place of meeting will be Atlantic City, N. J., and the dates October 12th to 16th inclusive. On Young's New Million Dollar Pier is where the convention sessions and the exhibition will be held.

The exhibit this year will be fully as large and more comprehensive and attractive than ever before. It will practically cover the entire area of the pier and will be under the control of the allied body, the American Street and Interurban Railway Manufacturers' Association.

Entertainment features of the convention are not completely arranged for, but it is believed the annual reception will be held on Tuesday evening, a vaudeville performance on Wednesday evening and a theater party on Thursday evening. There will be quite a number of special features arranged for the benefit of ladies attending the convention.

Two main convention halls will be provided for the meetings—the Greek Temple near the outer end of the pier and the Aquarium Court Hall near the entrance to the pier. In addition suitable meeting romos will be available at the Chalfonte Hotel and the Traymore Hotel.

The parent body, called for short the "American" Association, will hold sessions on Tuesday, Wednesday and Thursday afternoons. The Engineering Association will hold its meetings on Tuesday afternoon and on Wednesday and Friday mornings and afternoons, Thursday being set apart for inspection of the exhibits. The Accountants' Association will meet Wednesday, Thursday and Friday mornings. The Claim Agents' Association will assemble on Monday afternoon, Tuesday morning and afternoon and Wednesday morning. The Transportation and Traffic Association will gather on Monday afternoon and on Tuesday, Wednesday and Thursday mornings.

Aside from the reports of the officers and standing committees of these affiliated associations a large number of original papers will be presented to each body. Among these to be heard by the Accountants will be "Organization of the Accounting Department of an Electric Railway and Light Company," by A. R. Patterson, Savannah, Ga.; "Interline Accounting of Interurban Railways," by W. H. Forse, Jr., Anderson, Ind.; "Accounting Methods of a Holding Company," by P. S. Young, Newark, N. J.; "The Effect of Electrification on the Accounting Methods of Steam Railways," by A. B. Bierck, Long Island City, N. Y. The Engineers will discuss a number of subjects, such as standardization, power generation and distribution, car and carhouse wiring, maintenance and inspection of electrical equipment, the exact titles of the papers and their authors being not yet available.

The Claim Agents will listen to the reading of papers on "The Claim and Its Disposition," by Peter C. Nickel, New York city; "The Organization of a Claim Department for a Small or Moderately Large Company, Including a School of Instruction as a Means of Preventing Accidents," by Francis J. Ryan, Syracuse, N. Y.; "Uniformity in Claim Department, Records and Accounts," by J. J. Reynolds, Boston, Mass.; "The Duties of Claim Agents and Other Officials of Quasi-public Corporations to the Public," by Eugene R. Roberts, Knoxville, Tenn. Among the papers to be presented to the Transportation and Traffic Association will be: "How Can a Small Road Best Promote Traffic and Increase Its Revenue," by Ernest Gonzenbach, Sheboygan, Wis.; "Carrying of United States Mail on Electric Railways, Its Advantages and Disadvantages, and the Compensation Therefor," by C. H. Hile, Boston, Mass.; "Progress to Date in Carrying Freight and Express Matter by Electric Roads—Some Mistakes that Have Been Made and Their Remedy," by C. V. Wood, Boston. Mass.; "The Operation of Multiple Car Trains on Interurban Roads," by D. F. Carver of Trenton, N. J. An interesting symposium on "The Possibilities of a Well-conducted Publicity Department" will be engaged in by Messrs. G. S. Brush, B. R. Stephens, C. E. Flagg, G. H. Gall, C. W. Lamb and others.

FAVOR TELEPHONE TRAIN ORDERS

At a meeting of the western division of the Association of Railway Telegraph Superintendents held in Chicago last week 18 representatives of the largest railroad systems west of the Ohio River were present and endorsed the action of several railroads in supplanting telegraphic communication by telephones in dispatching and blocking trains.

The telegraph superintendents favor the telephone and advise its use as a valuable, quick and safe means for train orders and blocking. They discussed the matter thoroughly, viewing it from all possible angles and concluded that the future will see an extended and combined use of the two methods of despatching. Mr. W. J. Camp of the Canadian Pacific Railroad is president and Mr. George W. Dailey of the Chicago and Northwestern is vice-president of the Telegraph Superintendents' Association.

PROGRAM OF THE KANSAS CONVENTION

The eleventh annual meeting of the Kansas Gas, Water, Electric Light and Street Railway Association will be held at the Stilwell Hotel, Pittsburg. Kan., on October 8th and 9th. The program of papers has been prepared and will be substantially as follows:

President's address, by C. L. Brown, Abilene, Kan.

"Street Lighting—Arc and Series Tungsten," by N. R. Birge, General Electric Company, Schenectady, N. Y.

"Electrical Jobbers," by P. B. Chaney, Monarch Electric Company, Kansas City, Mo.

"The Correct Rate to Be Charged by Central Stations," by W. A. Scothorn, Hutchinson, Kan.

"Commercial Insulation of Wire," by F. H. Dimick, International Lecture Institute, New York.

"Finances of the Light Business," by H. V. Forest, Winfield Electric Light Company, Winfield, Kan.

"Steam Turbines," by C. R. Mackay, Toledo Railways and Light Company, Toledo, Ohio.

"Incandescent Lamps," by S. E. Doane, National Electric Lamp Association, Cleveland, Ohio.

"Our System of Bookkeeping and Records," by Dow R. Guinn, Pittsburg Water Supply Company, Pittsburg, Kan.

This program will be followed by discussions from the question box and by the election of officers for the next year. A number of entertainment features have been provided for already. This matter is in the hands of Messrs. Wells, Edwards and Myers. The secretary and treasurer of the association is James D. Nicholson of Newton, Kan.

ONTARIO POWER LINE CONTRACT LET

The hydro-electric power transmission plan from Niagara Falls to the towns and cities of Western Ontario has at last reached the period when the contract for the erection of the line has been let. The total length of line to be built is 293 miles, with 3,176 steel towers. The contract calls for a main line from Niagara Falls to Dundas, with lines from the latter place to Toronto, London, St. Marys and St. Thomas, and was let to a construction company for $1,270,000, the lowest of 27 tenders, and includes all the lines in one contract.

According to the American consul at Owen Sound, Mr. A. G. Seyfert, the line as now planned covers only western Ontario, but there is an important concession clause in it for additional lines of equal length to cover eastern Ontario at any such time as the people of that section of the province may ask for the privilege of Niagara power.

The contract will necessitate the use of 507 tons of aluminum wire, together with 140,000 pounds of telephone wire. The towers will be 66 feet high and consume 6,554 tons of steel to build them. The estimated cost of the towers is $621,000. All the work is to be completed by December 1, 1909. The material for the construction of this gigantic electric power transmission scheme is to be Canadian made as far as it is possible to secure it.

MISSOURI RIVER POWER DEVELOPMENT

Important borings have been completed by the Stone & Webster Engineering Corporation for the foundations of the new dam which that company is building for the United Missouri River Power Company at Hauser Lake on the Missouri River, near Helena, Mont. It will be remembered that this work consists in replacing the dam which was destroyed last April. The borings for the foundations of the new structure have been sunk 16 feet into solid rock and have established the presence of a solid and very hard, flinty rock ledge at an average depth of 55 feet below the normal water level. There have been ordered 2,000,000 cubic feet of timber for the cofferdam and 100,000 barrels of cement for the dam proper. An electric-light plant is under construction and arc and incandescent lighting will be supplied for night work. The first move in the construction of the second large dam which is part of this project, also to be built by Stone & Webster, is in progress. This is the building of a spur from the line of the Montana Central Railroad to the site of the dam at Wolf Creek, 20 miles below Hauser Lake.

SOME TUNGSTEN-LAMP EXPERIENCES[1]

By William Chandler and D. B. South

It will be the purpose of this paper to give in a brief manner some of our experiences at Sault Ste. Marie with actual installations of tungsten lamps. Not being an engineer, I shall not attempt to use the technical terms of one, but will confine myself to words of one syllable, so to speak. My references will be to store and interior lighting, having done nothing whatever in our city with regard to outside lighting, although there may be a small field there for it. The outside commercial lighting of our city is being done almost entirely with 6.6-ampere arc lamps.

The quality of the light produced from the tungsten lamp is beautiful, soft and pleasing to the eye. In our opinion it is the most satisfactory light yet given us in artificial illumination, and the distribution of the light excels any other filament lamp. Its intrinsic brilliancy is such that it appeals instantly to a merchant as an ideal illuminant under which to display all classes of goods and merchandise.

The filaments of the lamp are anchored at the top and bottom, and the shape and size of the bulb is very similar to that of the ordinary 32-candlepower carbon lamp except that it is somewhat longer. We have observed no bad effect upon the lamp from voltage fluctuation, although our regulation is quite good, and we do not know or pretend to say what effect poor regulation would have upon the filament of the lamp. The lamp attains its maximum brilliancy at once upon being switched on, and does not come on with a flash and then dim down to its normal standard of candlepower, as has been noted to be the case with some other types of lamps, viz., the tantalum, on alternating current.

Two years ago, soon after the first tungsten lamps were produced in this country, the engineers and managers of the Edison Sault Electric Company had a conference regarding the best manner of utilizing this lamp to meet the most dangerous competition at that time appearing against the electric-lighting field—the gas arc. The aim was also to use it in such a way that it would give the consumer more light which he needed and at the same time in such a manner as to not make a radical reduction in the station output. Then, again, the absolute impossibility of the manufacturing companies to manufacture lamps in sufficient quantities as to make a general substitution made it appear necessary to limit its use to places where it would do the company and the consumer the most good. This pointed to its use as a substitute for the gas arc and to those places where the gas arcs were making the greatest inroads. This led to making a fixture to burn four 40 or 50-candlepower lamps in a cluster. The extreme delicacy of the filament at 120-volts, and the very large percentage of breakage in shipments, led to the suggestion of making a 30-volt lamp and installing them four in series on a 120-volt current. This method was finally decided upon, and orders were placed for the manufacture of this class of lamps and fixtures for their use. To avoid accidents and possible burn-outs from carelessness of such expensive lamps, we had them mounted on T-H bases. The special fixture was necessary, because the filament is so fragile that the lamp must be installed pendant to secure the best results.

The lamps ordered came in due season, and I think the Edison Sault Company was the first company to make any considerable installation of tungsten lamps in a commercial way. Like most other new filaments, there were some defects in the first manufacture on a commercial scale, but probably not more than should have been expected. Notwithstanding such drawbacks, our installations have proven a very great success, and we have seen no reason to doubt the wisdom of our own decision that the 30-volt series type of lamp was the best to use until such time as the manufacturers of the lamp have more nearly reached its perfection, and increase their facilities so as to supply the demand and at the same time give the companies time to properly adjust their business to the new conditions, these conditions being the production of over twice the quantity of light from the same output of power. We have believed from the first that this change, properly handled, would prove not only a benefit to the consumer, but to the lighting companies as well. To that end we have been pushing our business along these lines, and very successfully. Our customers are more than satisfied, for they have more than double the quantity of light for the same money, while the company is supplying them with more, rather than less, current.

Our first order was for lamps taking from 55 to 57 watts per lamp and giving about 40 candlepower. When they came they were about a 75-watt, 50-candlepower lamp. This, while it gave fine illumination and better light, could not be made to compete in cost with the gas arc, as we desired under our conditions. These lamps did not, however, prove to be up to the standard contracted for. Over half of them blackened up badly after a few hours' use. Samples of the blackened lamps were sent to the manufacturer, and we were assured by them that the defects could be remedied. We, therefore, gave an order for several thousand 40-candlepower, 55-watt lamps. Of this we have received two shipments, but the 50-candlepower lamps, while they went down a good deal after the manner of a row of bricks, proved a better average of usefulness than the 40-candlepower type coming later. We have kept very accurate data of the useful life and behavior of the 40-candlepower lamps, which we have forwarded to the manufacturers from time to time, and which we think will be of great service in improving the quality of future production. We regret that the 50-candlepower lamps did not receive the same care and attention in the beginning in following up and noting their eccentricities. While most of them were of very short useful life, there are some of them that seemed to lead a charmed life, burning up to the present writing (June 15th) upward of 1,400 hours, with little if any diminution of light or semblance of age. Of course, all this detail of care has caused great inconvenience and sometimes annoyance, but we feel that we can afford to gather this data until such time as the manufacturers of the lamp have put it past its experimental stage.

We adopted the plan of either selling the lamp outright at $1.50 or renting a set of four at 50 cents per month and maintaining the lamps. This placed them on the same basis as gas arcs in our city, or less, as far as cost of service is concerned, but in quality the illumination from gas cannot be compared with the tungsten lamp.

For the last two years, during which time we have been experimenting with the tungsten lamp and waiting for the manufacturers to make and deliver the lamp ordered, there have been many improvements made in these lamps. The various manufacturers seemed to vie with each other to see which would produce the more perfect lamp. Claims are now made that the 120-volt lamp filament has stability to withstand the jar of shipment, but from all the information I can obtain the breakages in shipment still continue at a very much too large percentage for profit. Many lighting companies are now putting out the regular voltage tungstens in limited numbers with very satisfactory results. Still our experience and investigation have been such as to force us to the conclusion that the plan first adopted by our company would have been the wiser one to have been pursued by the lighting companies and co-operated in by the manufacturers. We believe that no attempt should have been made to put the high voltage tungsten on the market until such a time as the lamps were more nearly perfect and commercially serviceable, using the low-voltage series lamp in the meantime so that both the lighting companies and the manufacturers would have been largely benefited thereby.

We have made no attempt to secure residential lighting with tungsten lamps, and must admit that the series method of installation above described would probably not meet with much favor in that class of lighting, but neither would the large candlepower units thus far exploited be much more suitable.

We have in active service 164 lamps of 40 candlepower and 32 lamps of 50 candlepower. Disregarding those from which we received no service at all and considering only those of the 40-candlepower size which we have retired from service and of which we have reliable data, we got an average life from 181 of these lamps of 128½ hours; the range of time of service being from three hours to 800 hours. These two extremes are both exceptional. Quite a number reached 300, 400, 500 and 600 hours, but more failed under that length of time.

Some of the lamps retired from service were as black as Russian stovepipe, but the filaments had not parted in many cases. In some cases it was really remarkable, the candlepower the lamps were maintaining, even under these adverse conditions. This blackening of the bulb is the most serious defect noted in the lamp and the one to which the manufacturers should give the most attention.

Lamps that were retired when the filament had parted and welded together again were very few, but it did happen once or twice. We found from 234 of the 40-candlepower lamps about a dozen, which in all cases had been installed but a very short time, that the bulbs had turned a peculiar milky or smoky white. Upon close examination of these lamps the finest possible hole was discovered in the tip. Out of the same number 11 were found, the filaments of which had become broken in shipment. There were received 27 with the lamp terminals not properly soldered to the base, and eight which went out of commission immediately upon being screwed into the sockets for some reason unknown. From all of these, of course, we received no service.

The manufacturers rated the lamps at 1.25 watts per candle, but we found that a trifle high. We selected at random for testing 12 of the 40-candlepower lamps, i. e., three sets of four 30-volt lamps to be used on our 120-volt circuits, one hour burning for each test. A reading was taken every five minutes from a portable voltmeter and every 10 minutes from a switchboard voltmeter, and the lamps were connected to one of our regular watt-hour meters.

Test No. 1 showed 215 watt-hours recorded on the meter, with the voltage ranging from 116 to 118, or 1.35 watts per candle, with the voltage 2.5 per cent. below standard.

Test No. 2 showed 220 watt-hours recorded on the meter, with the voltage ranging from 118 to 122, or 1.375 watts per candle, with the voltage practically normal.

Test No. 3 showed 220 watt-hours recorded on the meter, with the voltage ranging from 119 to 123.5, or 1.375 watts per candle, with the voltage less than one per cent. above standard.

If it is true, and I think it is generally understood to be, that a four-burner gas arc consumes 20 cubic feet of gas per hour, a customer need only burn his gas 100 hours per month at $1 per thousand to have his gas costing him more than four of our 55-watt tungsten lamps taking 220 watts per hour, or .22 kilowatt-hours, burning the same length of time upon our prevailing rate of 14 cents per unit for the first 30 hours' use of his maximum demand, 4 cents per unit for his next 60 hours' use, and 2 cents per unit for each succeeding 30 hours' use—the cost to him being $2 for gas and $1.48 for electricity, which he will very much prefer on this basis surely.

In commercial lighting we have made the following tungsten lamp installations, viz.:

1. A Music Store.—Installed eight 50-candlepower lamps, which have burned approximately 1,400 hours. The candlepower of these lamps has not fallen off more than 10 per cent. Not a single lamp has been exchanged here since the original installation, which was made in April, 1907. These lamps are suspended on drop cord and distributed throughout the room, lamps hanging downward, with S 1 Holophane pagoda shades. The lamps have only recently begun to blacken and that only slightly. I would say that up to approximately 1,000 hours no change was noted in the light-giving quality of the lamps. Where we have installed the lamp in this manner we have always used the shade mentioned, and believe the best result is secured by so doing. The only objection noted to this type of shade is the amount of dust accumulating upon its corrugated surface.

2. A Meat Market.—We have here four 40 and four 50-candlepower lamps installed in the same manner as No. 1. The 50-candlepower lamps here have also burned approximately 1,400 hours with scarcely any drop in the candlepower, if any at all. This shop is decorated in white enamel, which, reflecting strongly the pure white light of the tungsten lamp, gives a most pleasing effect. At the time this installation was made in May, 1907, we were able to successfully compete with the gas company on bidding for the business, and this customer has proved to be a great advertiser for us, as his lighting bills and the ample light he is getting have been most satisfactory to him.

3. A Hotel (the leading one in our city).—This installation consists of twelve 50 and sixteen 40-candlepower lamps. (We note both sizes, but are gradually working them all to the 40-candlepower basis.) So many changes were made of the 50-candlepower lamps originally installed here and they have been moved around so much to get full service from those which have not failed that even an approximation of the useful life is hard to arrive at, but as it was made July 15, 1907, and as some of the 12 still remaining were of the original installation, it would indicate not less than 1,000 hours' burning on their daily average, with the lamps still in pretty good condition and giving nearly if not quite their initial candlepower. These lamps burn downward in a fixture owned by the consumer, which originally was wired for and contained six 16-candlepower carbon lamps, under a large porcelain shade. Thus, upon an expenditure of 220 watts per hour we gave this customer 160 candlepower units, where previously with 96 candlepower units his power consumption was 300 watts per hour per fixture. This cut down our revenue 80 watts per hour per fixture, but kept the gas arc from getting a foothold here.

4. A Drug Store.—Eight 50 and eight 40-candlepower lamps. We have practically no data on the 50-candlepower lamps installed here, but judge them to have burned about 1,000 hours thus far. These lamps are installed in specially designed fixtures with the lamps burning upward. Being one of our first installations we thought this to be the proper way to install the lamp to get the best results, but have decided otherwise in later installations. This business was retained by our company when about

1. A paper read before the Michigan Electric Association at Grand Rapids, August 18, 1908.

to go over to the gas company and the gas arc by using the tungsten lamp.

5. A Furniture Store.—This is the largest single installation of tungsten lamps we have made, consisting of thirty-six 40-candlepower lamps, and it is without doubt the finest lighted storeroom we have. We secured this customer from the gas company and displaced nine gas arcs with nine fixtures of four lamps each. This was the first installation made where we got away entirely from the fixture we originally had designed for the lamps burning upward and adopted one we thought would answer our purpose better with the lamps burning downward. This fixture is of brass finish, with square rods, and equipped with the S 1 Holophane pagoda shades makes a beautiful appearance. The lighting effect in the store is most excellent and pleasing, and we are proud of what we accomplished here. This customer is one of our hardest-headed business men and from being a "knocker" the tungsten lamp has developed a "booster" in him; any number of instances having been brought to our notice where he has worked overtime advertising the low cost and good light he is getting.

6. A Saloon (the finest in our city).—We displaced five gas arcs here and secured some very profitable long-hour business with an installation of twenty 40-candlepower lamps in fixtures similar to those mentioned in 5. This is a particularly hard room to light, but it is being done with these lamps in a manner highly satisfactory to the customer. The decorations are of red and green with little if any reflecting properties, and the use of the Holophane shades aided us greatly in satisfactorily making this installation and in pleasing the customer.

7. A Photograph Gallery.—Twelve 40-candlepower lamps. This business was also retained from going to the gas company. This installation is also on drop cords with shades and is similar to 2, already described.

8. A Grocery Store.—Twelve 40-candlepower lamps. Installed similar to 7. This business was secured in competition with the gas arc and is next door to the gas office where innumerable gas arcs are displayed, and is making good right along.

9. An Office.—Twelve 40-candlepower lamps. Installed similar to 6, except that the 3 D Holophane shade is used in connection with the lamp instead of the S 1. This is rather a large shade to use with the lamp, but a concentrating effect was desired here, and that is what this type of shade is designed for.

10. A Grocery Store.—Eight 40-candlepower lamps installed similar to 8. This business was secured from the gas company, the tungsten lamps displacing two gas arcs.

(The above 10 items refer to installations where all of the lighting of the customer is being done with the tungsten lamp. The following will treat of those we have made in conjunction with other lighting.)

11. A Hotel.—Twelve 40-candlepower lamps burning upward in the special fixture already mentioned. We displaced three gas arcs here with our tungsten units. The entire lighting of this customer is a combination of the carbon lamp, the tungsten lamp and the gas arc.

12. A Hotel.—Twelve 40-candlepower lamps. Installed identical with 11. These lamps also displaced three gas arcs.

13. A Drug Store.—Four 40-candlepower lamps. This customer had a fixture of his own with five 16-candlepower carbon lamps that was suitable for wiring for the series lamp burning downward, and, in connection with some Gem lamps, we are giving him good light and have increased his lighting account but very little, at least not anywhere near the proportion in which he has increased his store illumination.

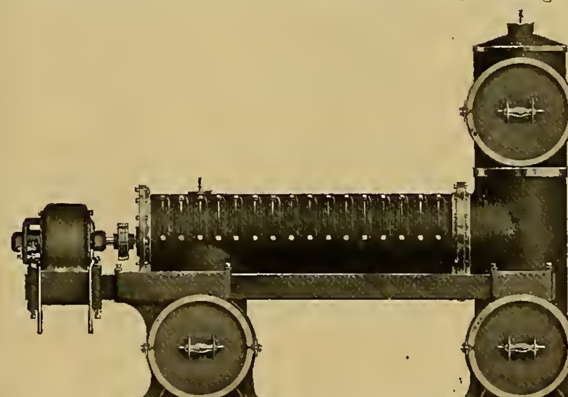
14. A Drug Store.—Four 40-candlepower lamps installed in the specially designed fixture with the lamps burning upward. His conditions are similar to 13. A further installation of tungsten lamps will be made here soon, as he is very well pleased with what he is getting from the new lamps. The entire lighting business of this customer was held by the tungsten lamp from going over to gas.

15. A Jewelry Store.—Four 40-candlepower lamps installed as referred to in 14. This unit burns nightly between two gas arcs and this customer has been unable to make up his mind since last November whether he prefers the tungsten unit or the gas arcs, but as he burns the tungsten set regularly we are permitting it to run right along in this manner, satisfied we will win over his entire business in the end, our contention being that he is getting a superior quality of light from our unit.

From our experience and observation, whether the series or multiple type of lamp is employed, I predict in the near future the very successful and general adoption of the tungsten lamp—possibly almost to the exclusion of nearly all other forms of incandescent lamps, unless improvement shall bring to the front some other lamp even superior to these. With so many manufacturers striving to that end the tunsten lamp must soon become commercially and mechanically as perfect as is the present carbon-filament lamp. The general use of these lamps brings to the central station important problems to solve. The cost to the consumer for a candlepower of light, including the cost of the lamp, will be a small percentage less. The income of the lighting company per candlepower furnished will be a very large percentage less, while the proportion going to the manufacturer for lamps is a very large percentage greater. It would seem, that, at least to the extent that the lamp manufacturer gains, the central station would lose, for in a very great majority of cases the consumer will not increase his lighting bill. It will not be necessary for him to do so. He secures a large increase in light anyway. To adjust these differences in such a way as to work out harmoniously for the benefit of the consumer and the producer of current is the province of the lighting company. The changes are so radical and affect such diverse interests that it will take the best thought and engineering skill to secure the best results without friction and without loss. It would seem that the popular and old-established free-renewal system which has done so much to advance the electric-lighting industry must be the first to go. It would seem fortunate that the change must come by slow degrees, owing to the inability of the lamp manufacturers to furnish the lamps in large quantities, which gives time for the readjustment, but the time is now at hand when all the problems connected with the impending change should be considered and discussed. There is no better place for the consideration and discussion of these problems than at such a meeting as this one is of the Michigan Electric Association.

ELECTRICAL VACUUM CLEANING

The new science of cleaning owes its latest development and possibility of wide application to the electric motor. The electro-mechanical method



ELECTRIC-DRIVEN TURBINE-EXHAUSTER FOR VACUUM CLEANING

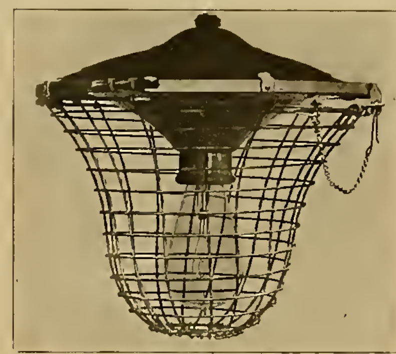
of cleaning is fast taking the place of the broom and dustpan which stir up the dust and allow most of it to resettle. Instead of this old-fashioned, semi-hygienic method, modern ingenuity has devised the scientific yet simple expedient of sucking in the dust and germs from floors, carpets, upholstery or any other place where it may accumulate and transferring it through tubes to a suitable receptacle, where it is collected. In addition to its hygienic perfection this method has the advantage of being easy and consequently cheap to operate. The system consists of the cleaning tools, which resemble brushes, the flexible tubes and the exhausting machine which contains the dust separator. The exhauster and dust separator can be conveniently located in the basement or cellar and connected by piping to inlets in the various rooms and halls where the flexible connections can be made.

The fact that the exhaust collector must be power-driven at first limited the application of this principle to places which had convenient power plants, but with the electric motor its use has been greatly extended. At present office buildings, theaters and residences are being extensively provided with exhaust-cleaning outfits. The latest improvement in exhaust collectors is the application of the turbine principle to the exhauster. The accompanying view shows one of these turbine exhausters driven by a form L motor, built by the Crocker-Wheeler Company, Ampere, N. J. The turbine has only two bearings and the automatic dust extractor is an integral part of the cleaner. When electrically driven the apparatus cannot be disabled by freezing, as may be the case when the dust-laden air current has to pass through a humidifier or where the power is obtained from steam. The cleaning tools used with this system have large orifices so that they will suck not only the dust but tacks, pins and scraps of paper as well.

The machine shown in the illustration is one of large size. The Crocker-Wheeler Company has been for some time supplying motors for exhausters of all sizes for use in various kinds and sizes of buildings.

AN ADJUSTABLE STREET-LAMP GUARD

A useful protection against broken street lamps on incandescent circuits is the Greenwood adjustable street-lamp guard. As shown in the accompanying views of the guard attached to the stand-



AN ADJUSTABLE STREET-LAMP GUARD

ard hood, it derives its support from a flat metal band in two parts, with thumb-screws which permit of adjustment from 12 to 15 inches. The guard basket is hinged on one side, with a clasp fastener on the other, allowing it to swing open easily for renewal of lamps. The wires of the guard are of hard-drawn steel, laced, and galvanized, so that rust is warranted not to occur by the makers. The guards are made to fit 14 to 17-inch shades and are manufactured by the Greenwood Manufacturing and Supply Company, 147 Milk Street, Boston, Mass.

NORTHWESTERN'S GOOD REPORT

The net profits of the Northwestern Elevated Railroad Company of Chicago, for the fiscal year ended June 30, 1908, were equal to 7.01 per cent. on the preferred capital stock. The gross earnings for the year were $2,463,187, showing an increase of $362,871, or 17 per cent. over the similar figure for 1907, $2,100,315. Expenses, however, increased $220,812, or 20.5 per cent., being $965,116 for 1908, compared with $744,304 for 1907. This latter increase, according to President M. B. Starring, was principally due to an increase in car-miles operated from 7,441,578 car-miles in 1907 to 10,316,296 car-miles in 1908. The net earnings of $1,498,071 for 1908 were greater by $142,059 than those of the preceding year, $1,356,011. The passengers carried by the Northwestern "L" have doubled in eight years. In 1901 18,950,167 weer carried, giving a daily average of 51,918. By 1905 these numbers had grown to

ADJUSTABLE LAMP GUARD, OPENED TO RENEW LAMP

26,812,825 and 73,460, respectively. Last year a total number of passengers during the year was 31,022,575 and the daily average 84,993. The year just ended records a grand total of 37,419,286, averaging 102,238 daily passengers, and making the average daily increase over 1907, 17,245, or 20.29 per cent,

POWER PLANT AT GATUN

A site has been selected for the power house at Gatun, Canal Zone, Isthmus of Panama, north of the unloading docks and near the east diversion. The power house will have a concrete foundation and basement and the superstructure will be corrugated iron over a wood frame. It will be 150 feet long and 84 feet wide.

In the boiler room will be six 400-horsepower water-tube boilers of the Keeler type, burning oil, with induced-draft fans in duplicate. The engine room will contain three turbo-generator sets comprising 1,500-kilowatt Curtis turbines connected to three-phase, 25-cycle, General Electric generators. The auxiliary sub-station equipmennt will consist of two 500-kilowatt and one 300-kilowatt rotary converters with the necessary auxiliary apparatus. A 20-ton three-motor crane will run the length of the engine room.

This power plant will furnish the current for unloading at the docks, for the motors on the lock cableways, and for the cable road. It should not be confused with the hydraulic power plant that will furnish the power to operate Gatun Locks, although it will probably be maintained as an emergency plant after the canal is completed.

THE FRENCH TARIFF

By the provisions of the amended French tariff some of the principal electrical commodities are dutiable as follows: Incandescent lamps per 100 kilograms, with fittings, $77.20; without fittings, $155.40. Dynamo-electric machines weighing over 1,000 kilograms, $5.79 per 100 kilograms; weighing between 50 and 10 kilograms, $23.16 per 100 kilograms, with intermediate sizes given a corresponding rating. Arc lamps, $28.95 to $15.44 per 100 kilograms. Accumulators, $4.05 to $3.18 per 100 kilograms.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, September 9.—Hydraulic power is to be used on a large scale in the Pyrenees region of France, according to a project which has lately been set on foot. The greater part of the power is intended to be used on the electric railroads, which are multiplying in this region, and for this purpose it is proposed to erect two hydraulic plants. These will rank among the large stations of the Continent, and one of the turbine stations alone is to cost over half a million. The lines of electric railroad will be controlled by the Southern Railroad Company. As regards the first of the proposed hydraulic plants, it may be erected in the valley of the Meslé, at Eget, in the Upper Pyrenees region. From the dam there will be built a four-mile canal which will lead to the turbine house, and in this way a high fall of 2,200 feet will be utilized. The turbine station will be controlled jointly by the state and the Southern Railroad Company, and the surplus power will be used in connection with an extensive pole-line network which will extend through a wide region. The profits from the sale of current in this latter case will come to the state, according to the present arrangement.

Tourists in Switzerland are already taking advantage of the new Mt. Blanc electric railroad, which is an extension of the Fayet-Chamonix line and now takes passengers up the slope of Mt. Blanc, where a wide prospect over the Alps is enjoyed while the tourists are comfortably seated in observation cars. The line proceeds from Chamonix to Martigny and St. Maurice, and from this latter point the return trip to Geneva can be made by the lake-shore railroad passing by the watering places of Evian and Thonon. The extension of the line will give it a greatly increased patronage, and the difference in the traffic is already being felt.

In Switzerland there is now being carried on an extensive piece of construction work for a hydraulic plant, which will be one of the largest in that country. The Dala River is to give the power in this case, and the greater part of the current is to be used for an electric-railroad system which is now being mapped out. According to the present plans, the railroad will start at Loesche and pass through a number of localities, ending at the watering place of Lieche. The work upon the electric-railroad line has already been started.

Many interesting papers are expected at the coming telegraph and telephone congress, which is to be held at Budapest on the 21st of September. On this occasion, which is the first international congress of the kind, will be assembled delegates from all the leading countries. It is intended to have the papers printed beforehand and distributed to the members, so that the discussion will be carried on to the best advantage. The members of the congress will have the opportunity to visit the different electrical enterprises which are centered at Budapest. A full program of the congress papers will soon be published.

Electric power is to be used to operate the new cable incline which passes up the slope of the Wetterhorn. This line has been building for some time and will soon be opened for traffic. The gradient is 190 per cent. and the cars will mount at the rate of 1.2 meters per second. A direct-current motor which works at 800 volts is installed for operating the cable. The cars will seat 17 persons, and will follow at eight-minute intervals. The maximum load is 15 tons.

In Austria there are plans on foot for four new electric railroads. The first of these, running from Attnanz to Selzthal, will be built first and will be used as a test line for constructing the others. The second line will run in the Vorarlberg district, while the third line passes from Trieste to Optschina, and the last starts from Vintschgau.

A. de C.

GREAT BRITAIN

London, September 12.—A couple of years ago there was considerable controversy in the press as to the likelihood of the gasoline omnibus superseding the electric tramway, but it died a natural death. During the last year the London General Omnibus Company has carried no less than 12,000,000 fewer passengers than during the preceding year, a result frankly admitted to be due in no small measure to the electric tramways. A paper read before the British Association last week gave some interesting details about electric 'buses, both of the storage-battery and trackless-trolley type. On the authority of the consulting engineers to the London Electrobus Company, it is stated that these vehicles, weighing 7½ tons when fully loaded, can easily run 40 miles on one charge without stress of the batteries, and that the current consumption on the streets of London does not exceed that of an average tramcar, after allowing for all losses. Nor is the wear and tear of the chassis, including the motor, anything like so great as that of the gasoline 'buses. The batteries, it may be remembered, are run under a contract of 2d. per mile, and one of the firms working under this contract has stated that six months' working is sufficient to pay for the batteries; further, that after six months' working, the batteries were still in good working order.

With regard to trackless omnibuses, I mentioned recently that a deputation from the Manchester tramways committee went to the Continent to investigate these. This commission has now returned and is understood to be reporting in favor of the vehicles. One of the places visited was Mulhausen, where the 'buses are running over a course of 6¾ miles, and average 55,000 car-miles per annum. The installation has now been working some time, and the expenses, including repairs, renewals, depreciation and four per cent. interest, are said to be 5.13d. per mile, against average figures for tramways and petrol buses of 7.30d. and 9.45d., respectively. Of course, the tramcars have a larger capacity than the other two.

While on the question of locomotion, mention may be made of the proposal to run a service of electrically driven cabs on the streets of London. I am sorry to say that the response from the public to the prospectus was so disappointing that the directors felt themselves unable to proceed to allotment, and so for the moment, at any rate, the project will remain undeveloped.

A proposal is going forward for the erection of a statue to Lord Kelvin in Belfast, and no less than £1,852 has been subscribed already. Arrangements are being made with an eminent sculptor with regard to the proposed statue.

Some commotion was caused a few weeks back by an explosion and fire in a tent holding an airship at the Franco-British Exhibition, and hints were made at the first inquiry by the coroner that it had been caused by an electric fan. The adjourned inquest this week made it fairly clear that this was the case, but very little blame can attach to the fan when the use to which it was put is considered. The envelope of the airship—which was brought over from America a few weeks ago by a Captain Lovelace—contained about 9,500 feet of gas, and air was being pumped into it to make it tight, by holding the neck of the envelope over the wire framework of the electric fan, which was of the ordinary office pedestal type. The evidence went to show that the man who was intrusted with this task, after being instructed that sufficient air had been pumped in, continued to work the fan, and that eventually the air and the hydrogen became diffused, with the result that a spark from the motor of the fan set fire to it.

A test case was heard in Glasgow this week as to the rights of colliers, in their working clothes, to travel in the inside of tramcars. There is a by-law in existence there that the conductor has the power to order such persons to ride upon the outside, an authority which is now disputed. The court found itself compelled to uphold the by-law and fined the defendants, but a special effort is to be made by Mr. Dalrymple, the manager, to meet the convenience of the colliers wishing to travel by his cars.

G.

NEW ENGLAND

Boston, September 19.—A number of electric-light companies in Massachuetts have filed their reports for the fiscal year at the State House, and most of them make a very favorable showing. Among them are: Lowell, gross earnings, $331,269, net $110,739, dividends $74,400, surplus $36,339; Edison of Brockton, gross $208,180, net $83,449, dividends $34,250, surplus $49,199; Salem, gross $188,750, net $55,839, dividends $22,000, surplus $43,839; Fall River, gross $237,054, net $68,599, dividends $48,000, surplus $20,599.

The increase of fare from five to six cents on the Boston Suburban Electric Company's lines has put the railways of the company on a much better basis, and it is planned to resume dividends at an early date on the four per cent. cumulative preferred stock.

The Boston and Northern and the Old Colony street-railway companies, subsidiaries of the Massachusetts Electric Company, which sought sanction for an issue, respectively, of $1,250,000 and $750,000 new stock some time ago, now ask approval for the issuance thereof at $110 per share by each company.

The will of the late John Burnham Brown of Ipswich, Mass., who amassed a fortune as a contractor and investor in Chicago, provides for the establishment of an industrial institute at Ipswich, with an endowment said to be about $7,000,000.

B.

NEW YORK

New York City, September 19.—Mayor McClellan, acting as motorman, on Wednesday morning ran the first "L" train across the Williamsburg Bridge. The train started from the sub-surface station in Essex Street at 10:40 a. m., and arrived in Canarsie 34 minutes afterward. The train was loaded with city officials and members of the boards of trade of Williamsburg, Brownsville and Canarsie, and its passage over the bridge was regarded as an important epoch in the history of Brownsville, Canarsie, Ridgewood and other sections along the route. It was said that real estate in those places would boom marvelously and that the growth of population would be unparalleled when the regular train service was begun.

New York city is to have a three-cent fare street-car line if the promoters of the Greater New York Traction Company succeed in carrying out their plans. Articles of incorporation of the proposed company have been filed in Albany, and the Public Service Commission will be asked to grant a certificate of necessity. The company plans to operate in Fulton, Courtlandt and William streets and Maiden Lane, affording a crosstown service connecting with the Brooklyn Bridge, and the Fulton, Courtlandt and Barclay street ferries. The proposed rate of fare is three cents. The company will ask for franchises in several streets now occupied by horse-car lines.

The subway and tunnel entrance to New York under construction by the Pennsylvania Railroad is expected to be finished with trains in operation by May 1, 1909. The system will be electrical throughout and will represent an expenditure of $20,000,000.

In a competitive bid the American Railway Traffic Company, an offshoot of the Brooklyn Rapid Transit Company, has lost its contract for the removal of ashes in Brooklyn. After December 31st no more ashes will be carried over the B. R. T. lines. Trucks will be used by the successful competing company.

Judge Lacombe has granted the petition of Receiver Whitridge of the Third Avenue and Union Railroad companies for permission to apply for franchises for proposed extensions of both roads. A memorandum filed by Judge Lacombe completes in effect the severance of the transfer systems of the Metropolitan and the Third Avenue Railroad companies. The decision of March last left in force transfers with the East Broadway, Dry Dock and Battery Railroad Company. By a rearrangement of routes and movements of cars since made, transfers will not be discontinued at certain points where they have been continued.

The Mardi Gras at Coney Island was the occasion for much electrical decoration, and the parade contained many electrically illuminated floats supplied with current from the trolley wires. Surf Avenue was a fairyland of lights, eevry store and amusement enterprise being lighted up to its capacity, while overhead along the whole length of the street were festooned garlands of electric bulbs. As the parade passed the lights along the way were put out.

The eighteenth annual meeting of the American Electrotherapeutic Association will be held in the Engineering Societies Building, New York city, on September 22d, 23d and 24th. Wednesday evening will be devoted to an exhibit of appliances and apparatus on the fifth floor adjoining the usual assembly hall of the New York Electrical Society. An invitation to be present during the sessions has been tendered to electrical men. W.

SOUTHEASTERN STATES

Charlotte, N. C., September 19.—The Charlotte Power Company, chartered under the laws of New Jersey and backed largely by interests behind the $10,000,000 Southern Power Company of Charlotte, N. C., has been incorporated, and while no definite announcement has been given out by the stockholders concerning their intentions, it is accepted generally that the new company will build a network of interurban electric lines from Charlotte to neighboring towns. The Southern Power Company has transmission lines already built to a score or more nearby towns, and the supplying of power for such an interurban system would be a matter of comparatively small additional outlay. The Charlotte City Council will be asked to grant a franchise for an electric railway line to enter the city.

W. S. Lee and L. C. Harrison have been granted a franchise to operate an electric-railway system in the town of Gastonia, 21 miles from Charlotte. Mr. Lee is largely interested in the Southern Power Company. It is said that the same parties propose to connect King's Mountain and Mt. Holly, cotton-mill centers, 32 miles apart, with an electric line.

The Southern Power Company has contracted with the city of Monroe and with the Henderson Roller Mills, Monroe Oil Mill, the Icemorlee and the Everett cotton mills, all in Monroe, to supply electric power and will build transmission lines to that city.

Petitions have been granted for a receiver for electric plants at four South Carolina towns—Rock Hill, Darlington, Florence and Marion. The Rock Hill receivership followed a suit against the company brought by the Commonwealth Title Insurance and Trust Company and P. A. Wilcox of Florence, S. C., was named receiver. The receiver was empowered to issue $50,000 receiver's certificates. Mr. Wilcox was later named as receiver of the Carolina Water, Light and Power Company, with plants in Marion and Darlington, and of the Florence Light and Power Company. In the case of the Carolina company the receiver is empowered to issue $30,000 receiver's certificates and in the case of the Florence company $20,000 certificates.

The town commissioners of Wake Forest, N. C., have ordered an election to decide whether $10,000 of electric-light bonds shall be issued for building an electric plant to light the town and Wake Forest College.

The Montgomery Light and Water Power Company of Montgomery, Ala., has announced that $100,000 will be expended in improvements to its plant at Tallassee Falls, about 30 miles from the city. About 10,000 horsepower additional will be developed.

The Carolina Power Company will expend $25,000 in concrete work to replace stone and earth work at Buckhorn Falls, and also expects to bring power to Raleigh, N. C., and other towns along the route by January 1, 1909. Starting with 4,000 horsepower at Raleigh, this amount will be increased with the demand.

E. W. Trafford, electrical engineer, has in hand the plans for the proposed new municipal electrical and lighting plant for the city of Richmond, Va., which is now under consideration and advisement by the municipal government.

The Rockbridge Power Company was granted a franchise to operate and construct a lighting system in the town of Buena Vista, Va., at a recently called meeting of the Town Council. W. G. Matthews of Clifton Forge, Va., and others are the stockholders of the electric company, and this company proposes to build a hydro-electric plant on North River, near Buena Vista, and to furnish lights and power to Buena Vista, Glasgow, Buchanan and possibly Lexington.

The Atlantic Coast Line Railroad has adopted electricity for lighting in its shops at Waycross, Ga., and switch and yard lamps will be electrically lighted. Orders have been issued for lights for 400 switches and for seventy-five 3,000-candlepower arc lights.

The Raleigh (N. C.) electric-railway system has been extended five miles and considerable double-tracking done during the past 12 months, representing an outlay of about $300,000. D. H. L.

OHIO

Toledo, September 19.—All week at the rest and display rooms of the Toledo Railways and Light Company, a demonstrator from New York has been engaged in showing Toledo ladies the advantages of the use of electricity in housework, including baking, ironing, heating water and making chafing-dish dainties.

Between three and four hundred electric automobiles are expected to join in the big automobile parade planned by the Toledo Retail Merchants' Association during the fall exhibit, to be held the first week in October. Prizes amounting to $200 will be awarded to the best decorated machines.

Another surprise was sprung this week in the municipal-light-plant dissension at Lima. Not a single councilman showed up at the meeting called for the purpose of giving the third reading to an ordinance repealing the one recently passed providing for the erection of the plant.

J. W. Cherry, local manager of the Bell Telephone Company at Sandusky, has resigned and will leave on October 1st for Paducah, Ky., where he will become manager of the Independent telephone company.

The power house of the Toledo and Western Railway at Sylvania has been permanently closed and power for the road is now being furnished from the Toledo Railways and Light Company. The power house will not be dismantled, but will be kept in good repair and held in reserve for an emergency. H. L. S.

INDIANA

Indianapolis, September 19.—The Westfield and Sheridan Traction Company, organized some time ago to construct a traction line to connect Westfield, Sheridan and other towns with Indianapolis, announces that the enterprise is assured and that work on the line will begin in a short time. The road will connect with the Indiana Union Traction line at Carmel and cars will be operated over that line into Indianapolis.

Incorporation papers have been filed with the Secretary of State by the Kendallville, Ligonier and Goshen Interurban Railway Company, which proposes to construct an electric interurban railway between the cities of Kendallville, Ligonier, Goshen and intervening towns. The road will form a connecting link in traction railway lines between Toledo and South Bend, or from lake to lake. C. C. Bayer of Kendallville is secretary of the company. The company is composed of local and Chicago capitalists, who are said to have ample means to build the 40 miles of road to enable through service from Lake Michigan to Lake Erie over the several roads now in operation by way of either Kendallville or Fort Wayne.

Work was begun on the Huntingburg and Ferdinand traction line, near Jasper, on the 12th inst. The contract to build the road has been let to a Terre Haute firm, and the breaking of ground was made the occasion for quite a celebration. This line when completed will be the first interurban line built in Dubois County.

Through car service from Kokomo to Bluffton, over the Kokomo, Marion and Western and the Marion, Bluffton and Western traction lines, was begun last week.

The new limited service between Indianapolis and Louisville via the Indianapolis, Columbus and Southern Traction Company and the Indianapolis and Louisville Traction Company has been established. Four "Dixie flyers" now make the trip from Indianapolis to Louisville each day, and four "Hoosier flyers" make the journey from Louisville to Indianapolis each day. This service is proving exceedingly popular and is said to be as fast as the steam-line service.

The managers of the Indiana Union Traction Company are so much gratified over the success of the new 50-ton, 800-horsepower electric locomotive built in its shop, that it declares that freight trains will be running over the system as soon as the bridges are sufficiently strengthened to enable the heavy cars to pass over with safety. The engine has sufficient power to pull from 20 to 40 cars loaded with ordinary freight. The electric locomotive is weighted down with 10 tons of gravel to add to its tractive power. The engine is proving very useful in the moving of coal cars and other heavy freight.

The City Council of Goshen has awarded a contract to Robert N. Ashe of Richmond, Ind., to install a new lighting plant for street and commercial lighting at a contract price of $39,857. Mr. Ashe is to receive his pay in rental until 1919, when upon payment of $3,587 the plant will belong to the city. A number of taxpayers oppose the contract and threaten to bring an injunction suit to render the contract void on the ground that the method of payment is simply a subterfuge to get around the limit of indebtedness.

The electric-lighting system of the new shops of the Big Four Railroad at Beech Grove, south of Indianapolis, was given a test on the 14th instant before a crowd of 150 invited guests. Cooper Hewitt mercury-vapor lamps are used and there are 221 of them.

The plant of the Elwood Heat and Light Company, valued at $300,000, is to be sold to a company composed of stockholders who have reorganized a company to improve and operate the plant.

The citizens of Darlington have voted to enlarge the municipal electric-light plant. It is understood that the work will be let by contract.

The telephone war with which Crawfordsville was threatened for some time has been averted by the Home Telephone Company withdrawing its petition for a new franchise. A committee from the Commercial Club learned that telephone companies in other cities throughout the country were making money at the same rate charged by the Home company. The improvements promised by the company in consideration of a new franchise will be made and some new equipment installed.

The Indianapolis, Columbus and Indiana Southern Traction Company has entered upon the work to build and equip a tie-treating plant near Columbus. The managers of the road say that the scarcity of timber makes it incumbent upon them to treat the ties with a chemical process so as to extend their life beyond that of an ordinary tie. W. G. Irwin, vice-president of the company, was present at a tie-treating test given on United States forest preserves at Pottsville, Pa., last week and returned greatly encouraged with the result of such process. S. S.

ILLINOIS

Peoria, September 19.—General Manager L. E. Fischer of the Illinois Traction Company, who has tendered his resignation, to take effect the first of the year, was in the city this week, with H. E. Chubbuck of Ottawa, who will take his place. Mr. Fischer and Mr. Chubbuck are making a tour of the property that Mr. Chubbuck will be called upon to manage, and the latter is taking this time to familiarize himself with the roads and plants of the company. Mr. Fischer has explained that he resigned as he wished to be with his family more than his present position permits. He is interested in some railroad properties near Cairo, and will build an interurban road in the southern part of the state.

The board of directors of the new line to be built from Galesburg to Aledo, known as the Galesburg, Aledo and Northwestern, held its first meeting in Galesburg this week, and will open the books for subscriptions for stock.

Norman Hickox, who for the last four years has been in charge of the purchasing department of the Consolidated Railway Company at Springfield, has resigned the position in favor of one as salesman for the General Electric Company at Chicago.

The Rock Island system is now building telephone lines to take the place of the telegraph system used by the company in the dispatching of its trains. The work is being done along the main line, and if the use of the telephone proves all that is expected of it, the lines will be extended to the entire system.

Many improvements have been decided upon by the Illinois Traction System, among which are the ballasting of the 17 miles of track between Chatam and Girard, the placing of 30,000 yards of ballast on the lines between this city and Springfield, the completion of the Decatur belt line and the installation of new and additional machinery in the power house in that city, the erection of a new boiler house and new passenger stations at Clinton, Cerro Gordo and Monticello. The company has purchased from the Haskell-Barker Company of Michigan City, Ind., 35 new 40-ton coal cars.

The Chatsworth Electric Light and Power Company has purchased the plant at Piper City of White Bros. & De More, and will build a high-tension line between the two towns, furnishing the current for Piper City from the Chatsworth plant.

The interurban line from Springfield to the park at Clear Lake was opened this week. The line is controlled by the Springfield, Clear Lake and Rochester Company, which is a part of the Mississippi Valley Interurban Company, and which also owns the street railway in the city of Hillsboro. A time card between the city of Springfield and Rochester has been put into effect and extensions of the line are planned between Hillsboro, Rochester and Pawnee. V. N.

NORTHWESTERN STATES

Minneapolis, September 19.—It is said that the central power plant for an electric road which is projected from Fort Dodge to Mason City, Iowa, will be located at Dows, Iowa.

The Rundell Land and Improvement Company is planning to install a complete system of electric street cars in Iowa City, Iowa.

The citizens of Tabor, Iowa, will vote on the proposition to grant the Malvern Light and Power Company a franchise to light the town and to issue $7,500 bonds for stock in the company.

G. C. Smith, city clerk of Boissevain, Man., will take bids up to noon, September 28th, for an electric lighting plant, including boilers, engine, generator, switchboards and street-lighting apparatus.

The City Council of Wymore, Neb., has appointed a committee to draft a plat of the electric lights needed and to confer with the electric company.

Mr. Lamphere will install an electric-light plant at Gresham, Neb.

At a recent election to vote on the kind of a light plant to be installed at Pender, Neb., 80 voted for electricity and four for gas.

The electrical display of the Commercial Club of Huron, S. D., during fair week was highly satisfactory.

Changes, improvements and additions are being made to the electric-light plant at Cumberland, Wis. One or two three-phase generators, 75 to 100 kilowatts in capacity, will be installed.

The Wild Rose Milling Company has a contract to install an electric-light plant at Wild Rose, Wis.

Jones & Hovey sold the Fairfield Gas and Electric Company of Fairfield, Iowa, to a local organization headed by E. A. Howard. Hugh Stephenson will remain in the capacity of superintendent.

The work of raising funds for the construction of an interurban line between Red Oak and Des Moines, Iowa, will be commenced immediately.

The indications are that the Cedar Rapids-Iowa City interurban will be extended to Muscatine, Iowa.

The Village Council of Eyota, Minn., is offering $2,000 electric-light bonds for sale.

Mayor Haynes of Minneapolis has become a candidate for re-election on the strength of his opposition to the proposed franchise for the central-station company.

The Eastern Wisconsin Railway and Light Company has commenced the work of welding the rails of the street-railway system at Fond du Lac, Wis.

Marcellus H. Snell has resigned as engineer at the Wisconsin Electric Railway Company's power house at Oshkosh, Wis., to take charge of an electric-lighting plant owned and operated by Oshkosh capitalists.

The first through car over the Milwaukee Northern Railway has been run to Oshkosh, Wis.

The Common Council of Washburn, Wis., passed a resolution to turn back to the Washburn Electric Light and Power Company the electrical equipment bought from that company over a year ago.

The Bell Telephone Company, having completed its conduit system at Iowa City, Iowa, is laying 8,000 feet of lead cable.

A resolution was introduced into the City Council of Dubuque, Iowa, instructing the city attorney to investigate the city's position in relation to the management, control and fixing of rates of the Iowa Telephone Company.

At a meeting of the Interstate Telephone Company at Dubuque, Iowa, a contract was signed with the Iowa Telephone Company under which the lines will have toll connections.

The Eldora Mutual Telephone Company of Eldora, Iowa, is taking bids for the erection of a telephone building.

Albert Strong, who was with the local telephone company at Denison, Iowa, is now in Kansas, in the interests of the Kellogg Switchboard and Supply Company of Chicago.

A. F. Rosenberger, representing the Roberts Telephone Company, has been demonstrating the working of the system at Webster City, Iowa. R.

WESTERN CANADA

Winnipeg, September 19.—The British Columbia Electric Railway Company has let a contract to John MacDougall & Co., Montreal, for the installation of a new 11,000-horsepower turbine at Lake Buntzen, B. C., which, with other improvements at the power plant, will cost approximately $300,000. R. H. Sperling, Vancouver, B. C., is managing director of the company.

Since the Alberta government has taken over the telephone system every effort has been made to give the farmers a speedy and effective telephone service. In the Edmonton rural districts six lines, each 12 to 18 miles in length and having an average of 12 telephones, have been installed. The farmers who have subscribed say the telephones are givng satisfaction and are of daily benefit.

Colonel Anderson, chief engineer of the Marine and Fisheries Department, has left for a tour along the coast of British Columbia to select six wireless-telegraph stations for the Dominion government. The locations of these sites have been practically decided upon from the recommendations of shipping men, but nothing definite will be decided upon until the report is presented to the government. The sites are: Prince Rupert, Cox Island, Triangle Island, Skidegate Inlet, Skincuttle Inlet and Digby Inlet. Suggestions have been received by the department to locate stations at Bella Coola, Port Essington and Thurlow Island, and these places will also be inspected.

The North Bay Electric Light and Power Company has made a proposition to the Town Council of North Bay, Ont., to light the town for 20 years under a 20-year franchise, the first three years of which is to be exclusive. On the other hand, the company will sell its plant to the municipal authorities for $75,000.

F. E. Cambridge, city electrician at Winnipeg, has returned from his trip of inspection taken with a view to discover the best system of bonding of street-railway lines to prevent electrolysis. While away he visited Cleveland and Toronto and picked up some valuable pointers on bonding. He recommends that the local street-railway company rebond all its lines by the brazing system, and suggests that an engineer from either Cleveland or Toronto be engaged to visit Winnipeg and make a report.

The ratepayers of Winnipeg, Man., will shortly vote on a by-law to provide $200,000 for a police patrol signal system and several suburban police stations which, together, will cost $200,000. Address F. E. Cambridge, city electrican, Winnipeg, Man.

The city of Saskatoon, Saskatchewan, is installing a new fire-alarm system. The boxes are being supplied by the Northern Electric Company at $2,001.75 for 21 boxes of the non-interfering type.

The new telephone exchange of the Manitoba Telephone Commission in Fort Rouge, a suburb of Winnipeg, Man., will be completed by October 1st. After that date the telephone system of Winnipeg will be run in two sections, north and south. F. C. Patterson is chairman of the commission.

The Winnipeg Electric Company has made an offer to the City Council of Winnipeg to supply the city with 10,000 electrical horsepower annually on a 10-year contract, for $18.40 per horsepower-year. The company will guarantee a sufficient supply to meet all requirements, and if necessary will enlarge its plant at Lac du Bonnet, where the city is attempting to build a municipal power plant at a cost of approximately $3,500,000, and has already spent some $500,000 on the work. R.

PACIFIC SLOPE

San Francisco, September 16.—Detailed plans for the extensions to be made by the Northern California Power Company, Consolidated, are not yet available. A special meeting of the board of directors of the company has been called for November 11th to consider the matter of creating a bonded indebtedness of $10,000,000.

The water shortage is getting more serious in its effect on the big hydro-electric plants in the Sierra Nevada Mountains. This week for the first time the large plant of the Pacific Gas and Electric Company at Electra began running on part time, and the number of mills and dredgers shut down for lack of power in the mining counties has been considerably increased. It is raining at some points in the state now and there is a possibility that the rainfall may be sufficient to relieve the power situation within a few days.

The large power plant of the California Petroleum Refineries, Ltd., at Oilport, Cal., which has been idle since the company's pier at that place was washed out two years ago, is now being taken apart and the parts coated with tallow to save them from the deteriorating effects of the salt air. The power plant consists of two 750-kilowatt machines with a motor-generator set for the company's electric railway which was used in transporting oil. It cost approximately $200,000. The fact that the machinery is being taken apart and oiled seems to indicate that the reports of an early rebuilding of the pier and the resumption of operations at Oilport are unreliable.

The Mount Whitney Power Company, which owns power plants and transmission lines in Fresno and Tulare counties, California, will during the fall make several important changes in its transmission system. Plans for the development of additional power are already being carried out in the mountains.

Stone & Webster of Boston, who control a number of electric power companies in Washington, have completed plans for a sub-station at Puyallup, Wash. The structure will be 40 by 40 feet, two stories high, with an L for the batteries.

The Cascade Development Company, which has been organized to build a hydro-electric power plant on Lindsey Creek, near Hood River, Ore., has been incorporated at The Dalles, Ore., by A. W. Mohr and W. A. Johnstone of The Dalles and P. T. Calles of Portland.

Advices from Condon, Ore., state that three surveying parties are out on the proposed electric lines of the Wasco County Electric Company. Surveyors are also at work at the power sites on the John Day and Deschutes rivers.

A. T. Axtell and others of Fairview, Ore., are planning to erect a small power plant on the Axtell farm for the lighting of the town of Fairview.

J. M. DeCoster of St. Anthony, Ida., has located a power plant site on the Teton River, 22 miles east of St. Anthony, Ida., where power is available for the development of 14,000 horsepower. He says that a plant will be erected in the near future.

W. D. Pinkstone, one of the owners of the Chloride-Bailey and the Globe mines in Trinity County, California, is in San Francisco arranging for electrical machinery for a power plant to operate a 20-stamp mill.

H. O. Lague of Oroville, Cal., has appropriated 25,000 miners' inches of water from the Feather River for power purposes.

The annual report of the electricity commission of Alameda, Cal., shows that the net earnings of the municipal electric-lighting plant for the last year were $23,799.49. During the year the operating expenses were $51,099.54, and $61,549.40 was spent on construction. The list of private consumers increased by 464 during the year.

Col. D. C. Collier of the San Diego Electric Railway Company has left for New York in connection with the company's proposed line to Point Loma. He states that the line will be completed by February 15th next.

The Northern Electric Company of Sacramento has commenced work on its line on C, Thirty-first, X and Front streets, which will be used chiefly for the transportation of freight. According to the company's franchise, only four months remain for the building of the road.

W. A. Cattell has resigned as president of the Petaluma and Santa Rosa Electric Railway Company, and has been succeeded by E. M. Van Frank, who will also continue his former position as general manager.

The El Monte Home Telephone Company has been incorporated at Los Angeles, Cal., with a capital stock of $25,000.

The Pacific Telephone Company of San Francisco will build a new branch exchange building at Spokane, Wash., at a cost of $150,000. A.

PERSONAL

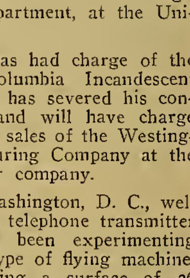
Prof. M. C. Beebe, formerly associate professor, has been appointed professor of electrical engineering in charge of the department, at the University of Wisconsin.

Mr. Vincent Gray, who has had charge of the Illinois district for the Columbia Incandescent Lamp Company of St. Louis, has severed his connection with that company and will have charge of the lamp, detail and supply sales of the Westinghouse Electric and Manufacturing Company at the Milwaukee office of the latter company.

Mr. Emile Berliner of Washington, D. C., well known as the inventor of the telephone transmitter which bears his name, has been experimenting recently with the helicopter type of flying machine, using a two-bladed fan having a surface of 36 square feet. The whole apparatus is simply and substantially constructed of steel and aluminum. The engine weighs 100 pounds and the propeller is capable of lifting 360 pounds, according to the inventor.

Gardner Dexter Hiscox, well known as the author of a number of books on mechanical and engineering subjects, died on September 13th, at his residence in East Orange, N. J., after a short illness. He was born in Elizabethtown, N. Y., 86 years ago, and, although without college training, devoted his life to scientific work. He was best known as the author of "Compressed Air and Its Application," "Modern Steam Engineering" and "Hydraulic Engineering." He was a member of the American Astronomical Society.

Lieut. Thomas E. Selfridge, U. S. A., who was killed by the falling of Orville Wright's aeroplane at Fort Myer, Va., on September 17th, was one of the group of young army officers keenly interested in aerial navigation, and his death is deeply lamented. He was attached to the Signal Corps and was a gentleman of high character and of unusual technical skill in scientific matters relating to that branch of his profession in which he was especially interested. He was well acquainted with Mr. Bion J. Arnold, the consulting electrical engineer of Chicago, who is himself an interested observer of progress in aeronautics. Mr. Arnold spent the Sunday before the accident with Lieutenant Selfridge, Orville Wright and other friends in Washington, and as he knew the officer was soon to make a flight his parting salutation was, "Good luck—and no accidents!" Previously Lieutenant Selfridge (who had had considerable actual experience with flying machines) had said that even if the aeroplane did fall, it was altogether likely that the mass of muslin, wood, wire and other debris would make a cushion which would break the fall so that the



Copyright, 1908, by Waldon Fawcett, Washington, D. C.

LIEUT. T. E. SELFRIDGE, U. S. A.

occupants would not be badly hurt. Mr. Arnold was much attached to his friend and was deeply affected when he learned of Lieutenant Selfridge's death as a result of the precise form of accident they had been discussing a few days before.

Mr. J. ARTHUR DOANE of Marengo, Ill., who has been the superintendent of the Elgin and Belvidere (Ill.) Electric Railway Company, has tendered his resignation and, it is understood, will be succeeded by Mr. A. A. Lightfoot. As superintendent, Mr. Doane has been a valuable executive for the company and has displayed ability in handling questions of management during the time he has been at the head of the road.

ALBERT P. SEYMOUR, for many years an active member of Pass & Seymour, manufacturers of electrical specialties at Solvay, N. Y., died early on the morning of September 13th at his home in Monrovia, Cal. Mr. Seymour was engaged in the electrical business throughout practically all of his career. For many years he was connected with the Electric Light and Power Company of Syracuse. He then became a partner of Pass & Seymour, which firm was later incorporated. On account of ill health he retired from the business in 1906 and has since spent most of his time on his estate in California.

ELECTRIC LIGHTING

The Asheville (N. C.) Electric Company will expend $30,000 on improvements and new electrical machinery.

The Malvern Light and Power Company has applied for a franchise for an electric-light plant at Tabor, Iowa.

R. L. McCauley and others have organized a company to construct a light and power plant at Stillwater, Tex.

The City Council of Grand Forks, N. D., has passed a resolution ordering all city electric light wires underground as well as the wires of corporations, which were required to be buried some time ago.

The Monroe (Utah) Light and Power Company has been incorporated with $25,000 capital stock. John Mason is president. The company owns an electric-light plant, a grist mill and 160 acres of land.

Fire destroyed the power plant of the electric lighting company at Oregon, Ill., on September 12th, entailing a heavy loss. The destroyed plant was a large, modern and well-equipped one in every respect.

The Bristol (Tenn.) Gas and Electric Company has just placed an order for new generators, turbine engines, condensers, etc., to the value of $50,000. The new machinery will give the company a capacity of 2,250 horsepower.

Montgomery, Ala., will expend $100,000 in improving the lighting service. A new power and lighting company, with capital stock of $20,000, has been formed to build a plant and furnish power and light for Phenix City and Girard.

Opposite Hutchinson the largest electric sign in Kansas has just been erected on the roof of the salt plant, across the Arkansas River, in South Hutchinson. The sign runs north and south across the building and is ninety-six feet long. The letters are five feet long.

Lux, the clever "miniature magazine of light literature" published by the Nernst Lamp Company of Pittsburg, notes that bowling on the green is carried on at night by enthusiasts in Montreal. Nernst lamps are used, being preferred to arc lamps, it is said, owing to absence of flicker.

Electric-sign owners in Grand Rapids, Mich., must hereafter keep such signs continuously illuminated from dusk to 10 o'clock or the Board of Public Works will order them removed. The City Council came to this decision as a result of one merchant's failing to keep his electric sign burning. A resolution was adopted which requested the Board of Public Works to order the sign relighted.

The occasion of starting up the new electric-light plant of the Compania de Luz Electrica y Fuerza Motriz at Tapachula, Mexico, was marked with a notable celebration in which government officials and many prominent citizens participated. The power is derived from a hydro-electric plant which is said to be one of the most modern in Mexico.

During the Founders' Week celebration in Philadelphia, October 4th to 10th, the City Hall is to be illuminated with 300,000 incandescent electric lights. Rows of lights will be installed in the city colors, gold and blue, and the national red, white and blue. Eight large shields and a painting of William Penn, 24 feet square, will be among the decorative features to be electricallly illuminated, and electric searchlights will be placed on the tall buildings of the city. The symbolic lamp posts being erected as permanent fixtures surrounding the building to typify the 28 boroughs and townships which compose Philadelphia will be a prominent feature of the electrical display. Those on either side of the portals will carry lights of 3,000 candlepower each, and the others 2,800 candlepower each.

The engineering department of the National Electric Lamp Association announces that Dr. Edward P. Hyde, now of the Bureau of Standards, after October 1st will organize and direct a department of physical research, under the auspices of and at the expense of the association. Dr. Hyde, with a sufficient staff, will operate his department with entire freedom from commercial suggestion and with the same frank publicity which has characterized his work at the Bureau of Standards.

ELECTRIC RAILWAYS

Citizens of El Paso, Tex., have subscribed $45,000 for the building of an interurban to Valley, thirty miles from the city.

Pay-as-you-enter cars will be installed on the lines of the Columbus (Ohio) Railway and Light Company in November.

Buffalo and Utica, N. Y., are now connected by an electric railway. Passengers are transferred from one system to another at present, but through service will be put on later.

Stone & Webster of Boston have purchased the Seattle-Everett interurban road, a new electric railway line under construction, promoted by Fred E. Sander and associates of Seattle.

The North Jersey Rapid Transit Company of Paterson, N. J., has been organized to operate railroads in Bergen County. It is capitalized at $1,000,000, and the incorporators are headed by T. J. Maloney of Jersey City.

The Fayetteville (N. C.) Street Railway Company will use electricity instead of gasoline motors hereafter in the operation of its street-railway system. Orders have been placed for poles, wiring, etc., for an overhead trolley system.

In the new rules of the Chicago City Railway Company the motormen are cautioned to approach all bridges, curves, crossings and special work slowly at all times and under all circumstances. The rules end with the emphatic injunction, "When in doubt, stop."

When the work contemplated by the Harriman interests on the street railway and terminals of Salt Lake City, Utah, is finished, about $6,000,000 will have been expended. Real estate amounting to $900,000 has been purchased and the power plant at Devil's Gate will cost $350,000.

At Tulsa, Okla., plans have been completed for what is probably the largest interurban traction project west of Indiana. A company is being organized to construct over 400 miles of interurban electric lines connecting Tulsa, Muskogee, Vinita, Bartlesville, Sapulpa, Shawnee, Oklahoma City, Okmulgee, Claremore and intermediate points.

The Billings and Cooke City Railway Company will build an electric railway from Billings, Yellowstone County, Montana, to Cooke City (the latter located within six miles of the northwest corner of Yellowstone Park), Park County, Montana. The road passes through a rich farming region underlaid by valuable deposits of coal, iron, silica and lime.

The War Department has insisted on eight cents as the fare to be charged for the trip between Cheyenne and Fort Russell by the Cheyenne Electric Street Railway Company, which has been granted a right-of-way through the military reservation. The company desired to make the fare 10 cents, but the War Department refused a right-of-way until the eight-cent agreement was signed.

The Sarnia tunnel electrification on the Grand Trunk Railway between Port Huron, Mich., and Sarnia, Ont., under the St. Clair River, is in successful operation. The single-phase, overhead-contact system is used, and a very heavy freight and passenger traffic is handled—said to be the heaviest, indeed, on any electric-railway service in the world—on two per cent. grades. Bion J. Arnold was the consulting engineer.

The Chicago, Milwaukee and St. Paul Railroad is again considering the Rock Creek cut-off between Butte, Mont., and Missoula. The route is said to be 26 miles shorter than by way of Drummond, though the grade is considerably heavier, but possibilities of greater electric power along Rock Creek are an important factor in the decision. It is the purpose of the Milwaukee road to use this natural power wherever available, and along the St. Joe River, in Idaho, work has been in progress for some time on a series of dams and power stations which are to supply the power for moving the trains over the Idaho division through the tunnel at Raft into Montana. Electricity generated by waterpower will play an important part in moving trains through the mountains, and after the system is completed little steam power will be needed between Missoula and Lewiston, Idaho.

A widespread method of "scalping" city street-car transfers has been disclosed by the arrest of William Santo of Chicago, who has exploited the transfer system of the Chicago Railways Company for a year. According to the police, Santo earns $30 a day from the sale of transfers, which more than 20 agents purchase from passengers, giving a newspaper as payment and selling the transfer for five cents, with a newspaper "thrown in."

A Boston paper of September 17th says: "The suit of the General Electric Company against Arthur E. Appleyard, brought to recover against him as the indorser of notes of the Central Market Street Railway Company of Columbus, Ohio, and the Columbus-London and Springfield Street Railway Company, was finally disposed of in the Superior Court yesterday. An agreement of the parties for an entry of 'neither party' was entered up in the case."

Cleveland, O., now has a three-cent ticket or cash fare if change is tendered, otherwise a full nickel is charged. Universal transfers are issued, but only upon the payment of an additional penny. This penny is returned to the patron by the conductor to whom the transfer is presented, providing the transfer is legal tender within the time limit specified by the issuing conductor. This is done for the purpose of discouraging patrons from asking for transfers unnecessarily.

A double-decked street car, as an experimental model, is being built at the shops of the Cleveland (Ohio) Municipal Street Railway Company. In the design some difficulty was experienced because the double-deck model cannot be higher than 14 feet, owing to the small clearance left by some of the crossing bridges. The present cars are 12 feet high. The model has crosswise seats on the first floor and seats that run the long way on the second. The aisle is high enough to permit people to stand upright, and this aisle space forms the second-story seat.

Negotiations are about concluded by which the Mexican Electric Tramways, Ltd., will take over the properties of the Mexican Electric Light and Power Company under lease. About $6,000,000 will be necessary to complete the great hydro-electric plant at Necaxa, increasing its capacity from 40,000 to 80,000 horsepower. Six turbo-generators are already in operation at Necaxa, five of which are running regularly 18 hours out of every 24, and the demand for power in Mexico City and the mining camp of El Oro makes the added equipment necessary.

Among orders recently listed by the General Electric Company is one for the Kobe Electric Railway Company of Kobe, Japan, a seaport town of some 200,000 inhabitants. This order is a comprehensive one and includes two 500-kilowatt, 25-cycle, engine-type, three-phase alternators; two 20-kilowatt, 125-volt, marine sets, to be used as exciters; one 40-kilowatt, motor-generator set, intended for use as a spare exciter; four 40-kilowatt transformers; 100 G. E.-78 railway motors, complete, and a complete switchboard equipment for the power house.

La Compania Minera las Dos Estrellas, owning large mines in the El Oro district of Mexico, is preparing to extend its electrical equipment to the railroad which it now operates between its mines and reduction mill. The company has found the cost of operating its extensive electrical system of mine railway to be so much lower than under the old method of handling ore that electrical energy is now to be applied to its surface road, replacing the steam locomotives now in use there. The company takes its power from the circuits of the Mexican Light and Power Company.

A company is being organized to build a number of interurban railways radiating from Kansas City, Mo. The first line may be built westward and southwesterly, taking in Lawrence and Topeka. From Topeka the line will go to Hutchinson and Salina. From Lawrence the road will take a southwesterly direction to Ottawa, Chanute, Parsons, Cherryvale, Independence and Coffeyville, and from the latter place into Oklahoma. The company also hopes to build and operate lines to St. Joseph, Excelsior Springs and St. Louis and other points in Missouri, decreasing the present freight rates of steam roads.

In their business of $18,300,080 during the last fiscal year, the Philadelphia street-railway companies report a deficit of $92,048.78, as compared with $364,048.53 for 1907. But a Philadelphia newspaper, in commenting on the report, calls attention to the fact that the directors in submitting their report have neglected to show the fixed charges to the amount of $400,000 interest on

$10,000,000 of Market Street Elevated Passenger Railway Company bonds, paid out of capital. This would make the deficit for the year reach a total of $492,048.78, an increase of $128,000.25 over 1907. During the period of the report 512,860,023 passengers were carried.

Great Northern Railway passenger trains will be running through the Cascade tunnel before January 1st, and probably by December 1st, drawn by electric locomotives. The construction department is rushing the finishing of one of the largest undertakings of its kind ever attempted in the West, and the Great Northern will be the first of the northern lines to operate passenger trains by electricity over any considerable portion of its road.

The Compania de Tranvias, Luz y Fuerza of Guadalajara, Mexico, which owns the electric street railway and light and power systems of that city, has had a survey made for a proposed electric railway 35 miles in length from Guadalajara to Chapala, on the northern shore of Lake Chapala. The latter is a noted pleasure resort which is much frequented by Mexican families of the wealthier class. The route of the new line will be by way of Juanacatlan, where one of the large hydro-electric plants of the company and a number of manufacturing concerns are located. The company has a capital stock of $14,000,000. Tomas Torres is general manager.

POWER TRANSMISSION

Miguel Bolanos Cacho is preparing to install a hydro-electric plant on the Coxapa River, state of Puebla, Mexico.

The Compania Minera el Rey is arranging to install a hydro-electric plant on the Presa River, in Mexico, to supply light and power for its mines.

Jose F. Buel will install a hydro-electric plant on the Ameca River, near El Salto, Jalisco, Mexico. The power will be utilized by industrial concerns in that section.

The Ontario Power Company has completed a transmission line from Niagara Falls to Syracuse, N. Y., 150 miles, and by its charter must furnish current along the route. Farmers, particularly dairymen, are making great plans for using the current for all kinds of farm work.

The hydraulic power plant of the Freeport (Ill.) Electric Company at Brown's Dam, on the Pecatonica River, is completed and will be used to furnish power and lights to the two plants operated and owned by the Moline Plow Company. Between 400 and 500 horsepower will be available from the new waterpower.

An ordinance which proposes to purchase a hydro-electric power plant to be built by the Nebraska Power Company for the sum of $2,500,000 has been brought before the South Omaha, Neb., council. The plant is to be built at Columbus and the electricity transmitted to South Omaha. The capacity of the plant is planned to be 15,000 horsepower.

A steel tower line 160 miles in length, between Butte, Mont., and the plant of the Madison River Power Company, will be finished within three months. The line will transmit 12,000 horsepower at 46,000 volts. The poles are 45 feet in height and spaced 550 to 1,000 feet. Suspension insulators will be used and two ground wires will be carried the length of the line.

A company has been organized to develop the waterpower at Fraser Falls, the largest natural water falls in the Yukon, generating electricity for a fleet of dredges to be operated on the Stewart river. The enterprise will involve the outlay of millions of dollars. The company has 105 miles of the submerged area of the Stewart River under lease from the government.

The machine shop at La Boca, Canal Zone, Isthmus of Panama, is at present belt-driven by a French compound engine, which takes steam from four French boilers. Plans have been approved for driving by electric motors, and two 75-horsepower motors will be installed in a few weeks. The current will be furnished by the new power plant at La Boca. A 15-ton overhead crane, now in use, is to be fitted with electric power.

The Santos Dock Company, through whose docks most of the coffee exported from Brazil passes, has recently received from the General Electric Company complete generating-station equipment—five revolving-field, 3,000-kilowatt, 2,300-volt, three-phase, 60-cycle, alternating-current generators, three 50-kilowatt exciters, 15 1,000-kilowatt, step-up transformers, transforming the generator voltage to 44,000 volts, with complete switchboard of most modern construction. Some time ago a comprehensive order, including complete sub-station equipment, wiring and lighting supplies, and a large number of induction motors for operating air compressors, hoists, cranes, etc., was received from the Santos Dock Company. This apparatus is now being shipped to Brazil. The hydro-electric plant is located some 35 miles from the sub-station, and, besides furnishing power for operating all the machinery at the docks, will also supply energy for light and power to various other industrial enterprises near the city.

The Stillwater Power Company proposes to install electric power plants on the Stillwater River in Montana. Three plants will be located within a radius of two miles in the Stillwater Canyon, about 80 miles from Billings, and 20 miles from Cooke City, and will develop over 36,000 horsepower. This will supply electric railways, mines and mills, and the pumps for an extensive irrigation system. G. H. Savage, at Billings, Mont., is secretary of the power company.

A spillway 300 feet wide and costing $15,000 will be built to connect the Chicago Drainage Canal with the Desplaines River at Willow Springs, Ill. In the spring months, when the Desplaines River overflows its banks, the flood waters often reach the south branch of the Chicago River through the old Ogden ditch. Frequently the volume of flood water is so great that it turns the current in the Chicago River from the drainage channel toward the lake.

The Ontario Power Company has awarded a contract for an extension 100 feet long to the south side of its power house, at Niagara Falls, Ont. The contract involves 10,000 cubic feet of concrete construction and a great amount of excavation. Several hundred men will be set to work immediately, working day and night to complete the work by December 1st of this year, which is the time set in the contract. The enlargement of the power plant will permit of the installment of two additional units of 12,500 horsepower each.

The Aztec Queen Mining Company is preparing to install a 4,000-horsepower hydro-electric plant on the Miravalles River, in the territory of Tepic, Mexico, to furnish power for operating the machinery of its Huicicila mines and to supply an electric railway, 16 miles in length, which it will build to connect its mines with the port of Platanitos, on the Pacific Coast. These mines are producing large quantities of very rich ore. The company has a capital stock of $3,000,000 gold, and is composed of Americans. W. E. Clark is general manager.

An announced intention of the Sanitary District of Chicago to build a large office building for the purpose of housing the various departments of the board of trustees has been criticized by a Chicago real-estate man. He declares that the Sanitary District trustees are exceeding the powers originally contemplated by the Legislature, which were conferred solely for the purpose of protecting the drainage interests of the city, and that by branching out into the sale of electric power and real estate the board has over-stepped its legal rights as planned by the framers of the original law.

One of the largest electric power transmission enterprises in the Southwest is being promoted by W. E. Fletcher and E. Krause of El Paso, Texas. These gentlemen have acquired the water rights along the Penasco River in the Sacramento Mountains and have planned to construct a canal which will divert the water into Cox Canyon, where a large hydro-electric plant will be installed. Transmission lines will be built from this plant to Alamogordo, Cloudcroft, Orogrande and other towns in New Mexico, and to El Paso, Tex. Cox Canyon will be converted into a water-storage reservoir by means of a dam, which will be built at a suitable point.

TELEPHONE

At Denison, Tex., the Grayson County Telephone Company will spend $75,000 in installing a new system.

J. K. Wilson and others are organizing a company at Eagle Pass, Tex., with a capital of $30,000, to establish an Independent telephone system.

The American Telephone and Telegraph Company keeps up its excellent showing in the August statement just made public, net earnings for the month being greater than for August, 1907, by $429,080.

The new central telephone exchange of Paris was destroyed by fire on September 21st, causing an estimated loss of $5,000,000. The fire originated in the basement of the exchange, it is reported, and was transmitted up the cable shaft to the top floors. Two hundred operators were at the switchboard at the time. The Gutenberg or main central exchange of the Paris telephone system was of the common-battery type and was put into service only a month ago. It had a capacity of 10,000 lines, but on account of its trunking connections it is thought that 20,000 lines in Paris, comprising all in use by the various ministries, the newspapers, banks and commercial houses, and all of the provincial and international trunk section of the plant, were rendered inoperative by the fire. The new exchange had been two years building and at last a month will be required before temporary switchboard connection can be installed.

The Kansas City (Mo.) Public Utilities Commission has been instructed by the City Council to institute a thorough investigation of the books and records of the two telephone companies furnishing service in Kansas City, to ascertain by direct testimony the income and operating expenses of each and the profits each is earning. This investigation is expected to give the council information on which to base legislation regulating telephone rates.

PUBLICATIONS

The Gregory Electric Company, Chicago, has issued its large descriptive price-list for September, covering the extensive stock of electrical machinery and apparatus kept in stock at its warehouses, corner Sixteenth and Lincoln streets, Chicago.

The monthly stock list of boilers, engines, dynamos, motors and machinery issued for September by Wickes Brothers, Saginaw, Mich., Pittsburg, New York and Jersey City, represents an imposing array of steam and electrical machinery and machine tools which the firm manufactures and handles.

Direct-connected generating sets are described in Bulletin 4617, recently issued by the General Electric Company of Schenectady, N. Y. Besides a detailed account of the steam parts, the driving units are classified into tandem-compound and single-cylinder engines, the latter type having gravity and forced oil-feed lubrication.

"Denver the City of Lights" is the title of a pamphlet published by C. M. Smyth of Denver, Colo. It contains some 24 night views of Denver streets and buildings, showing the illumination for the recent Democratic national convention. All the current for the lighting shown in the pictures was furnished by the Denver Gas and Electric Company.

"Tungstolier Testimony" is convincingly presented by the Tungstolier Company, 520 Citizens' Building, Cleveland, Ohio, in a book of miniature reprints of letters received by the company. The saving, the illumination and the life of the illuminant are the salient points brought out in the letters.

Cooper Hewitt mercury-vapor lamps for direct and alternating current are described in bulletins Nos. 19, 20 and 21, published by the Cooper Hewitt Electric Company, 220 W. Twenty-ninth Street, New York city. These lamps are equipped with automatic starting devices which operate either by tilting the lamp or impressing a disruptive potential across starting terminals.

"Rubber Covered Wires of Quality" is the title of Price-list No. 22, just issued by the New York Insulated Wire Company, giving prices on rubber-covered wires based on various copper prices from 11 cents to 21 cents. The booklet also contains various tables which will be found of value. It will be sent to anyone who uses or deals in rubber-covered wire upon addressing the company at 114-118 Liberty Street, New York city.

Among the recent publications of the Electric Storage Battery Company of Philadelphia are catalogues on the various types of the Chloride accumulator for all kinds of stationary service and on the types of Chloride and Tudor accumulators for car lighting. Each catalogue gives complete tables of sizes and numbers of plates, dimensions of containing receptacles, weights and prices of elements and of cells complete, besides lists of prices of electrolyte, jars, tanks, plates and other auxiliary parts.

A very timely and useful souvenir is distributed by the Automatic Electric Company, Van Buren and Morgan streets, Chicago. It is Rand, McNally & Co.'s "Political Atlas," relating to "The Men and the Issues of the Presidential Campaign of 1908." The book (11¼ by 14 inches) includes the platforms of the two leading parties and portraits of the candidates, the electoral vote since 1789, an excellent colored map showing the political division of the country in 1904, a summarized political history of the United States and other useful information. There are also some pictures of telephone exchanges built by the Automatic Electric Company. The whole makes a most acceptable souvenir.

SOCIETIES AND SCHOOLS

Subjects of electrical interest are going to play an important part on the program of the Western Society of Engineers for this fall and early winter. The following papers are announced, most of them being arranged for the electrical section of the society: September 25th, "Notes on the St. Clair Tunnel Electrification," by F. A. Sager; October 9th, "Distribution for Light and Power," by H. B. Gear; November 13th, "Electrolytic Corrosion of Boiler Tubes," by C. F. Burgess; December 2d, "The Reconstruction of Street-car Tracks in Chicago," by George Weston; December 11th, "Some Phases of Hydro-electric Development in the Northwest," by C. E. Freeman; January 8th, a traction subject; February 12th, "Multiple-cable Distribution in Telephony," by B. C. Groh.

The season of professional meetings of the American Society of Mechanical Engineers will be opened on Tuesday evening, October 13th, by a meeting of the Gas Power Section in the Engineering Societies Building at 29 West Thirty-ninth Street, New York. Mr. H. L. Doherty, chairman of the meetings committee of the section, will present a report for discussion, outlining plans for future work, and there will also be a discussion of standards to be used in gas-power work. Two papers will be read, one by E. A. Harvey on gas-producer plants, with data upon costs, performance, etc., and one by N. T. Harrington, giving the results of tests to determine the loss of fuel weight in a freshly charged producer, due to increase of ash contents in the fuel bed. The first paper will be illustrated by lantern slides, showing actual plants and plans for the arrangement of apparatus.

AUTOMOBILES

The electric automobile bus service of the Philadelphia Auto Transit Company will be extended to include a route from Thirty-third and Dauphin streets to Broad and Shunk streets, and the rate of fare on all the buses will be raised to 10 cents. The company has been operating both 5 and 10-cent routes, but in its petition explains that its route is more than twice that of the New York Fifth Avenue double-deck buses which charge 10 cents for a comparatively short haul.

TELEGRAPH

The annual report of the British Pacific Cable Board for the year ended March 31, 1908, shows that the amounts recoverable from the various contracting parties in respect of the loss for that period are as follows: United Kingdom, £17,322; Canada, £17,322; Australia, £20,787; New Zealand, £6,929. There has been a falling off of nearly £3,000 in the gross receipts.

MISCELLANEOUS

The British War Office is making use of an electrical method of marking horses upon the gums for the purposes of identification. Such a system for tattooing human beings, although not upon the gums, has been in popular use at many exhibitions in England.

Honolulu has 170 miles of city streets; 26 miles of electric street railway, on which 50 cars are regularly operated; two electric-light plants; one petroleum gas plant, with capacity of one-half million cubic feet a day, and a telephone service with 1,575 subscribers.

Low water in the Ohio River, where boys are playing ball in places in the usual channel, has caused an unexpected difficulty in the case of telephone and telegraph cables crossing the river. In some cases these cables have been exposed for a large portion of their length, and the companies owning them are digging trenches in the river bed, so that the cables can be placed in them and protected.

According to the daily papers, the carelessness of a servant who wrapped an electric flatiron in linen cloth and went to bed without turning off the current, was responsible for the destruction of the $50,000 home of John C. Fetzer at Hinsdale, near Chicago, last week. The fire started in the laundry in the basement, where the woman had worked until late, and at 2 a. m. the family was aroused by the roar of the flames, which had gained uncontrollable headway before aid could be summoned. The moral is obvious.

The 40,000-kilowatt hydro-electric plant at Nottoden, Norway, for the fixation of atmospheric nitrogen by the Birkeland and Eyde process, will shortly receive an addition of 200,000 horsepower to its manufacturing capacity, if foreign papers are to be believed. The plant will manufacture nitrates for agricultural purposes and also nitric acid. The present plant, which consists of four 10,000-kilowatt generators, has been very successful in its technical operation, while the product has been disposed of at a profitable price almost invariably in advance of production.

TRADE NEWS

The Dunfee Electrical Company of Denver, Colo., has been incorporated with a capital stock of $50,000.

The Holmes-Storey Universal Power Transmission Specialties Company has been incorporated at Columbus, Ga., with a capital stock of $100,000.

At Chicago the International Telephone Company has been incorporated with a capital of $60,000, to manufacture and deal in electrical devices. The incorporators are F. M. Burmeister, H. Shafer and John C. Burmeister.

A British firm of electrical contractors is reported by the American consul stationed in the city in question to be in the market for electric fans of 18, 24 and 36-inch diameter. Details can be obtained by addressing the Bureau of Manufactures, Washington, D. C., file No. 2621.

The American legation at Havana, Cuba, has forwarded a copy of the decree granting and describing the proposed improvements to the Havana electric railway. This copy will be loaned by the Bureau of Manufactures, Washington, D. C., to interested contractors or dealers in this class of material. Refer to file No. 2618.

Announcement is made by the National Battery Company of Buffalo, N. Y., that the receivership under which this company has been operating since last February was terminated August 19th. All claims against the company have been settled and the entire property has been restored to the stockholders. It is also stated that full control of the reorganized company has been secured by the Cutler-Hammer Manufacturing Company of Milwaukee, well known as maker of battery-charging rheostats and other electric controlling devices. The plant of the National Battery Company will remain at Buffalo, but the business will be conducted under new management and with ample capital.

BUSINESS

A. L. Swanson of Evansville, Ind., has been awarded the electrical contract for the seven-story Furniture Exchange building. This contract includes engine, generator and complete wiring system.

The Blake Signal and Manufacturing Company, 246 Summer Street, Boston, says that the following is a sample of many testimonials: "Enclosed please find 25 cents in stamps, for which please mail me as much Blake tube flux as this amount will pay for. I have used the sample tube you mailed me, and it certainly is all that is claimed for it and then some."

Allis-Chalmers Company has the distinction of building the first Corliss engine for direct connection to an electric generator. This unit was put in service nearly 15 years ago, and now more than 1,000 Reynolds-Corliss engines are in successful operation all over the world. Many of the early engines have been running continuously ever since. Among the largest engines ever built for direct connection are the combined horizontal and vertical compound heavy-duty machines constructed by Allis-Chalmers Company for the Manhattan and Subway stations of the New York City Railway. Some of the different styles of direct-connected Reynolds-Corliss heavy-duty engines are shown in Allis-Chalmers Bulletin No. 1510. Their reliability, durability, small cost of repairs and maintenance have insured a place for these engines among the world's leading prime movers.

DATES AHEAD

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

Kansas Gas, Water, Electric Light and Street Railway Association (annual meeting), Pittsburg, Kan., October 8th and 9th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

Sons of Jove (annual meeting), Buffalo, N. Y., October 15th and 16th.

Western Association of Electrical Inspectors, annual meeting, Chicago, October 20th to 22d.

Illinois State Electric Association (annual convention), Illinois Hotel, Bloomington, October 27th and 28th.

American Electrochemical Society (fall meeting), New York city, October 30th and 31st.

Association of Car Lighting Engineers (first annual convention), Chicago, November 16th to 21st.

Chicago Electrical Show (fourth annual), Coliseum, January 11th to 23d, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) September 15, 1908

898,427. Igniter for Explosion Engines. Henri Benoist, Paris, France. Application filed September 24, 1907.

A spark-plug construction is described.

898,430. Electrically Conductive Railway Rail Joint or Connection. Bancroft G. Braine, New York, N. Y., assignor to the Rail Joint Company, New York, N. Y. Application filed October 25, 1907.

The connecting plates embrace and are welded to the base flanges of the abutting rail ends.

898,485. Device to Prevent Trolley Wheels from Jumping. William O. Lane, Cleveland, Ohio. Application filed December 20, 1907.

A part of parallel guard arms is mounted on the trolley pole so as to straddle the trolley wire.

898,506. Apparatus for the Production of Ozone. John R. Quain, London, England, assignor of one-half to Edward Applegarth, London, England. Application filed February 12, 1907.

Air to be ozonized is passed between a set of parallel electrodes excited by high-tension current and enclosed by insulating and vacuum-containing envelopes.

898,509. Electrical Circuit Protector. Charles A. Rolfe, Adrian, Mich., assignor to the Rolfe Electric Company, Rochester, N. Y. Application filed December 29, 1903. Renewed February 13, 1908.

A thermal circuit protector is provided with a pair of line springs supporting a heat cartridge.

898,529. Electrical Laboratory Apparatus. Chester H. Thordarson, Chicago, Ill. Application filed April 17, 1905.

In this core-type transformer there are a number of independent and removable secondary coils.

898,540. Electrical Fitting. Edson B. Wilcox, Meriden, Conn. Application filed May 29, 1908.

A ceiling outlet is composed of an integral body with a central and two pairs of lateral passages. A pair of terminals is secured to the body.

898,544. Telephone Transmitter. Henry F. Albright, Elizabeth, N. J., assignor to the Western Electric Company, Chicago, Ill. Application filed October 28, 1907.

A diaphragm with a central opening has a button at its rear side having a stem projecting through the opening, a tapered, exteriorly threaded bushing upon the front face of the diaphragm about the opening, the bushing having a conical opening tapering from the diaphragm, and a nut for clamping the bushing about the stem.

898,569. Singe Register. John W. B. Faris, Skidmore, Tex. Application filed February 18, 1907.

Electrical connections are provided on a rotating drum carrying tapers. A signal is electrically operated each time a taper is discharged from the drum.

898,576. Telephone Switch. Verne E. Green, Galva, Ill. Application filed August 6, 1907.

The switch is composed of a pair of contact plates and several pairs of switch blades.

898,578. Electric Heater. Andrew J. Holmes, Tacoma, Wash. Application filed May 10, 1906.

An electric heater for use with alternating currents comprises a coil and core, both composed of hard iron or steel having permanent magnetic qualities.

898,607. Illuminating Apparatus. Jean Schmidt, Frankfort-on-the-Main, Germany. Application filed May 8, 1907.

In this apparatus there is a casing within which a number of pairs of electrodes are pivotally supported at different elevations, and means for simultaneously adjusting a number of the electrodes to vary all of the arcs.

898,610. Steam Calorimeter. Carl C. Thomas, Ithaca, N. Y. Application filed September 29, 1906.

A calorimeter adapted to permit the flow of steam therethrough contains electrical heating means, and electrically-operated means for measuring the energy used.

898,619. Telephone Apparatus. Frank W. Wood, Newport News, Va., assignor to Charles Cory and John M. Cory, New York, N. Y. Application filed April 17, 1907.

A combined transmitter and receiver has a trumpet with flaring mouth and curved body extending to the receiver, and a mouthpiece concentrically arranged therein, and having a body portion extending through to the transmitter. (See cut on next page.)

898,620. Telephonic Apparatus. Frank W. Wood, Newport News, Va., assignor to Charles Cory and John M. Cory, New York, N. Y. Application filed April 5, 1907.

A cylindrical casing has a partition dividing it into two compartments, one for the transmitter and the other for the receiver. A receiver arm is swiveled in the partition and extends to the ear of the user. A trumpet extends from the transmitter upward to the mouth of the user.

898,621. Automatic Contact Mechanism for Electric Revolution Indicators. Frank W. Wood, Newport News, Va., assignor to Charles Cory and John M. Cory, New York, N. Y. Application filed March 20, 1907.

The device is provided with terminals of a number of circuits arranged to bear against the rotating member, and means controlled by the direction of rotation for shifting the same into position for selecting and closing periodically one of the circuits.

898,633. Filling Apparatus for Storage-battery Jars, etc. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to the Edison Storage Battery Company, West Orange, N. J. Application filed December 10, 1903.

This nozzle has a valve and separate suction and supply pipes passing through the plug into the battery jar. It is used to fill in electrolyte up to a certain level.

898,642. Phonograph Attachment for Telephones. Andrew Hatchett, Louisville, Ky. Application filed November 4, 1907.

A transmitter for a telephone line is mounted near the diaphragm box of a phonograph, the record of which is driven by an electric motor.

898,643. Indicator. Walter O. Haymond and John O. Potter, Muncie, Ind. Application filed May 29, 1907.

A dial thermometer is equipped with an electrical alarm mechanism operating at definite temperature limits.

898,648. Electric Clock. Monnosuke Higuchi, New York, N. Y. Original application filed November 3, 1903. Divided and this application filed December 2, 1905.

The clock is provided with an electric alarm-bell ringing mechanism.

898,756. Outlet Box. George A. Lutz, New York, N. Y., assignor to the American Circular Loom Company, Portland, Me. Application filed January 5, 1907.

An outlet box in tubular form has an opening on the side that is closed by a special removable cap.

898,766. Electric Switch and System of Control. Joseph V. Mott, New York, N. Y. Application filed February 2, 1907.

A pole-changing gravity-operated switch mechanism has means whereby it includes variable resistance in the circuit between the motor and its source of energy.

898,771. Combination Electric Service Cut-out and Meter Panel. Henry E. McGowan and Edwin R. Ellsworth, New York, N. Y. Application filed March 9, 1907.

The panel consists of a casing with two compartments, one with the cut-outs and the other mounted on the door of the first and containing the meter.

898,782. Electric Hoist. Gustav Rasmus, New York, N. Y. Application filed January 28, 1908.

A drum is geared to the armature shaft of the motor through a worm and bevel gearing.

898,785. Electrolytic Apparatus. Marcus Ruthenburg, Lockport, N. Y. Application filed January 18, 1907.

In an electrolytic cell there is an electrode comprising a cylinder formed of volute layers of wire cloth and means for maintaining the layers in spaced relation.

898,921. Insulator. Thomas F. Purves, Wandsworth, London, and John Sinnott, East Finchley, London, England. Application filed February 3, 1908.

A leading-in insulator for telephones has a body portion with a chamber and with a cable passage extending into it from the exterior of the insulator, the chamber being for the reception of an insulating agent, and the body portion having wire passages extending from the chamber to the outer face of the insulator.

898,949. Advertising Device. Charles T. Wilks, Woodlawn, Ala. Application filed May 21, 1908.

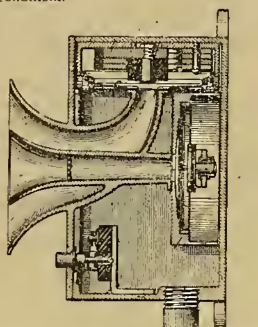
The movement of a hand wheel automatically opens and closes the circuit of an electric lamp.

898,968. Signal. David H. Coker, Piedmont, and Whitfield A. Scarbrough, Choccolocco, Ala. Application filed January 23, 1907.

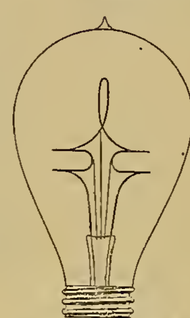
Means are provided for opening and closing the signal circuit by the operation of a railroad switch.

898,979. Process of Electrically Connecting Filaments to Supply Wires in Electric Glow Lamps. Hans Kuzel, Baden, near Vienna, Austria-Hungary. Original application filed January 19, 1906. Divided and this application filed March 26, 1907.

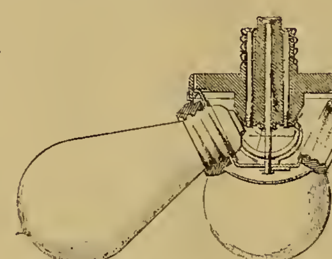
The process consists in mixing finely powdered metals, melting and forming carbides at high temperatures, with carbonaceous substances and with an agglomerant whereby a plastic mass is obtained, applying this to the points to be connected and gradually heating the mass in the absence of air to a white heat.



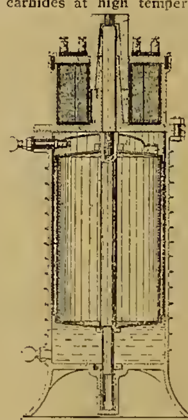
No. 898,619.—COMBINED TELEPHONE TRANSMITTER AND RECEIVER



No. 898,715.—INCANDESCENT-LAMP FILAMENT



No. 898,822.—WIRELESS CLUSTER



No. 898,987.—RHEOSTAT

898,649. Electric Clock. Monnosuke Higuchi, New York, N. Y. Application filed November 3, 1903. Renewed March 17, 1908.

An electromagnet is adapted to attract the actuating lever for the balance wheel.

898,675. Passenger-recording System for Trains. Walter E. Parr, Sparta, Mo. Application filed December 6, 1906.

Each car is equipped with a full-fare and a half-fare checking mechanism electrically operated by the weight of the passengers as they mount the steps of the car.

898,686. Electric Bell. Tito Rosati, Florence, Italy, assignor of one-fourth to Ferdinand R. Sari and Bartolomeo G. Giuliani, Washington, D. C. Application filed August 7, 1907.

A bell construction with a high-resistance magnet coil and pendent push button is described.

898,691. Electric-furnace Process. George O. Seward and Franz von Kügelgen, Holcombs Rock, Va., assignors to the Electro-Metallurgical Company. Application filed February 21, 1906.

This smelting process consists in maintaining a deep layer of the charge into which the electrode projects and by which it is surrounded, so that the arc is buried beneath the charge, and effecting renewal of the electrode material by progressive feeding in of new lengths without withdrawal of the electrode from the charge.

898,696. Electric-light Bulb Changer. Charles F. Southworth, Cambridge, Mass. Application filed February 13, 1908.

Attached to a handle is a base with a cylinder of rubber projecting upward and provided with internal corrugations to grasp the bulb.

898,698. Fuse Box. John O. Stivers, Denver, Colo. Application filed October 26, 1906.

A rotatable disk has mounted on it a number of fuses, each adapted to coact with the fixed contacts on the base plate.

898,699. Portable Telephone Apparatus. Frederick F. Strong, Boston, Mass. Application filed April 3, 1905.

A combined telephone transmitter and receiver has a sound collector provided with a centrally apertured sound-receiving tube leading to the ear mounted within the mouthpiece thereof.

898,715. Incandescent Lamp. Frederick M. Bennett, New York, N. Y. Application filed March 6, 1908.

There is an upwardly disposed filament loop, and a number of outer loops sidewise disposed so that the plane of each of the latter loops intersects the plane of the central loop at an angle. (See cut.)

898,752. Metal Filament for Electric Incandescent Lamps. Hans Kuzel, Baden, near Vienna, Austria-Hungary. Application filed July 16, 1907.

The filament loops are supported by a number of holding devices adapted to loosely guide the two sides of each loop and to hold the bights.

898,796. Telephone Set. Sol S. Sonneborn, New York, N. Y. Application filed October 1, 1907.

A desk telephone consists of a hollow standard or column having a transmitter and a switch hook, a telephone receiver forming part of the standard, a pair of ear cups and tubular connections therefrom to the receiver.

898,822 to 898,826. Plural Lamp Socket. Reuben B. Benjamin, Chicago, Ill., assignor to the Benjamin Electric Manufacturing Company, Chicago, Ill. Applications filed February 23 to March 1, 1907.

The five patents cover various forms and features of the well-known Benjamin separable wireless clusters. (See cut.)

898,847. Apparatus for Exploding Mine Charges. Charles I. Dodson, Pittsburg, Kan. Application filed April 6, 1907.

A clock is arranged to close the primary circuit at a predetermined time.

898,848. Means for Exploding Blast Charges. Charles I. Dodson, Pittsburg, Kan. Application filed February 14, 1908.

This is a modification of the above.

898,858. Means of Obviating the Deleterious Effects of Oscillations. Clarence Feldmann, Delft, Netherlands, and Josef Herzog, Budapest, Austria-Hungary. Application filed January 30, 1907.

An iron-sheathed cable system has its fittings constructed with non-magnetic metal.

898,862. Electric-railroad Signal. Timothy C. Fogarty, Frank W. Brock and Frank A. Bowdle, Chatham, Ill. Application filed January 13, 1908.

A signal at each end of a block is governed by a four-quadrant ring switch that is operated by a movable track device.

898,888. Spark-gap. Isaac S. Hirsch, New York, N. Y., assignor to E. B. Meyrowitz, New York, N. Y. Application filed July 18, 1907.

One member of a spark-gap of an X-ray machine consists of a revoluble frame including two uprights and disks secured between the uprights.

898,898. Telephone-receiver Support. Mose M. Kahn, Louisville, Ky. Application filed August 30, 1907.

Upon the transmitter support is mounted a bracket with means for holding the receiver to the ear of the user.

898,915. Electric Signaling or Telegraph Apparatus for Use on Vehicles. Robert B. North, Soho, England. Application filed June 4, 1907.

This is a device for signaling from the passenger to the driver of a vehicle. Lamps are arranged to light according to a certain code.

898,987. Rheostat. Heinrich Poth, Brooklyn, N. Y. Application filed December 8, 1905.

The rheostat is provided with an electromagnet having a coil in series with the motor armature and another coil in shunt therewith. (See cut.)

898,992. Alarm. Jay A. Robinson, Denver, Colo. Application filed October 26, 1907.

This alarm is operated in conjunction with an electromagnet adjacent the receiver hook of a telephone.

899,012. Electric Clock. Monnosuke Higuchi, New York, N. Y. Original application filed November 3, 1903. Divided and this application filed September 15, 1905.

In this patent further details of the clock described in Nos. 898,648 and 898,649 are covered. These relate to the hour-striking mechanism.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired September 22, 1908:

459,737. Electric-railway Conductor Support. E. M. Bentley, New York, N. Y.
459,757. Electric Arc Lamp. M. S. Logan, Otterville, and J. H. Barley, Sedalia, Mo.
459,772. Electromagnetic Motor. N. Tesla, New York, N. Y.
459,786. Electromagnetic Device. G. R. Lean, Boston, Mass.
459,794. Rheostat for Electric Motor Cars. S. H. Short, Cleveland, Ohio.
459,800. Rheostat. H. E. Waite, New York, N. Y.
459,810 and 459,811. Governor for Dynamos. M. S. Conly, Chicago, Ill.
459,815. Electric Railway. R. M. Hunter, Philadelphia, Pa.
459,846. Attachment for Electric Arc Lamps. V. A. Thomas, Providence, R. I.
459,855. Terminal Station for Handling Rapid Transit Passenger Traffic. A. P. Massey, Watertown, N. Y.
459,863. Electrical Recorder for Voltmeters, Thermometers, Etc. C. W. Ayton, St. Louis, Mo.
459,872. Electric Lamp. D. Tommasi, Paris, France.
459,917. Contact for Electric Program Clocks. F. E. Smith, San Jose, Cal.
459,923. Armature for Dynamo-electric Machines and Motors. J. Beattie, Jr., Fall River, Mass.
459,930. Duplex Telegraphy. J. J. Ghegan, Newark, N. J.
460,040. Motor Mechanism for Electric Cars. S. H. Short, Cleveland, O.
460,046. Method of and Apparatus for Converting the Electrical Energy of Alternating Currents into Mechanical Motion. C. S. Bradley, Avon, N. Y.
460,048. Electric Coupling. F. M. Farwell, Minneapolis, Minn.
460,059. Electric Regulator. J. F. McElroy, Albany, N. Y.
460,071. Electrical Transmission of Power. R. M. Hunter, Philadelphia, Pa.
460,076. Controlling Switch for Electric Motors. S. S. Wheeler, New York, N. Y.
460,081. Automatic Electro-pneumatic Tube System. W. G. Collins, New York, N. Y.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, OCTOBER 3, 1908 No. 14

THE 110,000-VOLT TRANSMISSION INTO GRAND RAPIDS, MICH.

Ten weeks of successful operation of the 110,000-volt transmission line into Grand Rapids, Mich., has fulfilled the predictions of high-tension authorities as to the practicability of such a working voltage and justified the courage of the local engineers in undertaking a transmission potential nearly twice that in any other locality in the world. For a year or more the 72,000-volt lines of the same Grand Rapids-Muskegon system had remained the highest operating voltage of authentic record, and so successful was the operation at this pressure that an even higher potential was decided upon for the new transmission line under construction from Croton Dam on the Muskegon River, to Grand Rapids. This was accordingly designed for 110,000 volts, and on July 16, 1908, it was put into actual service for the first time. Since then it has shown a gratifying steady performance.

This 110,000-volt line, whose characteristic construction is shown in Fig 1, is 50 miles in length, extending from the Croton Dam on the Muskegon River (shown in Fig. 2) to the Wealthy Avenue sub-station at Grand Rapids. It forms a part of the 212 miles of transmission system of the Grand Rapids-Muskegon Power Company which utilizes the waterpower of the Muskegon and Grand rivers to furnish light and power for neighboring cities and interurban railways. The Rogers Dam waterpower plant, on the Muskegon River, 18 miles north of the Croton Dam, is shown in Fig. 3.

At Croton Dam two 7,000-horsepower hydraulic turbine-generator sets utilize the head of 41 feet, generating 30-cycle current at 7,200 volts. This is stepped up through three 3,750-kilowatt transformers to 110,000 volts and transmitted over the steel-tower line to Grand Rapids, where a similar set of transformers receives it, lowering the potential to the sub-station bus-bar voltage of 7,200 as well as supplying a 20,000-volt transmission line to an interurban sub-station.

Croton Dam Development

Referring to the accompanying map of the Grand Rapids-Muskegon Power Company's transmission system (Fig. 4), the Croton Dam on the Muskegon River is near the junction with the Little Muskegon and seven miles from the railroad station of Newaygo. Construction work was begun in June, 1906, and as a foundation 3,000 oak piles and two rows of heavy interlocking steel sheet piling 30 to 36 feet in length were sunk below the river bed. The dam and power house are of reinforced concrete construction, the wheelhouse forming a part of the buttress. The concrete core wall of the dam is 300 feet in length and 42 feet high, set upon a foundation of steel piling. Two hundred feet down the stream from the flood gates there extends an apron of reinforced concrete from four to two feet in thickness.

The working head of the development is 41 feet and is maintained by eight steel tainter flood gates, each 13 feet by 20 feet, and a bear-trap or movable-crest dam 40 feet long. The power house has a floor area 75 by 125 feet and is 60 feet high. Reinforced concrete walls protect it from backwater, and the wheel section is of concrete construction for the lower 40 feet. Two sets of eight 45-inch Samson waterwheels mounted on horizontal 12-inch by 110-foot steel shafts drive the two 7,000-horsepower Westinghouse three-phase generators at 225 revolutions per minute, supplying 30-cycle current at 7,200 volts. These two generators with their exciters are shown in the interior view of the Croton Dam power house, Fig. 6.

At the site of the dam the river valley is about 600 feet wide, with banks 40 and 120 feet high, respectively. The waste-gate section of the dam is 238 feet long and its outer end adjoins the power house, which, with the turbine room, is 160 feet long. A fill embankment completes the remaining 200 feet of the dam across the valley. The dam required 30,000 barrels of cement and 1,250 tons of steel in its construction and impounds the waters of the Muskegon River to form a pond nine miles long and covering 1,600 acres. In the accompanying down-stream view of the Croton development, Fig. 2, the tainter gateways are seen in the left of the picture flanking the wider bear-trap. The brick building is the power house containing the generators, and at the right is the wheelhouse, each of the four tail-race tunnels taking water from two wheels on each of the generator shafts.

The tainter waste gates at the Croton and Rogers dams are of interest, as they were of special design. The gates are separated by massive concrete piers, and each closure swings on two bearings, six-inch cold-rolled steel pins imbedded in the piers. As the gates are well trussed there is no central bearing or through shaft needed. Each gate is fitted with a heavy oak block seating on a wooden sill carried on a 15-inch channel-iron imbedded in the concrete. The joints are made watertight by attaching five-inch strips of three-ply rubber belting on the up-stream face of the gate so that the pressure of the water makes a watertight joint. The gates are controlled by motor-driven hoisting crabs. The movable crest section has a vertical travel of 3½ feet and is operated by two motor-driven hoists.

On the down-stream side of the generator room are placed the three 3,750-kilowatt step-up transformers. These are water-cooled and oil-insulated and serve to step-up the generator voltage of 7,200 to the transmission potential of 110,000 volts. The frame and rows of strain insulators effecting the power-house entry are to be seen upon close examination of the Croton Dam exterior view, Fig. 2.

Fig. 1. A Right-angle Turn on the 110,000-volt and 72,000-volt Tower-lines Near Grand Rapids. The 110,000-volt Lines Are on the Right or Outer Side of the Turn

Fig. 2. Croton Dam Power Plant, Head of the 110,000-volt Transmission Line

Fig. 3. Spillway at Rogers Dam Power Plant, the Head of the 72,000-volt Transmission System

HIGH-TENSION TRANSMISSION LINES AND GENERATING STATIONS OF THE GRAND RAPIDS-MUSKEGON (MICH.) POWER COMPANY

110,000-volt Transmission Line

The 110,000-volt transmission line from Croton to Grand Rapids is the highest operating voltage in the world, as before remarked. For several years a California power company has enjoyed the reputation of operating at 80,000 volts, for which potential its lines were designed, but its engineers are understood to admit that the highest voltage ever actually worked has been 57,000 volts. A number of other lines are in operation, of course, at voltages in the neighborhood of 60,000.

The 110,000-volt line of the Grand Rapids-Muskegon Power Company is 50 miles in length. The wires are carried by Hewlett suspension-type, five-part insulators on large tripod steel towers having a tetrahedral form of bracing. These towers are 53 feet in height and spaced 500 feet apart on the straight course. Their bases are cemented into concrete anchors buried in the ground.

A stranded conductor with a hemp center and having a carrying capacity equivalent to No. 2 wire is used. The suspension and strain five-part insulators, with the method of attaching to the wire, are well shown in detail in Figs. 5 and 10. Each porcelain disk is 10 inches in diameter and is tested to 95,000 volts, so that the total break-down voltage of the series is almost half a million volts, giving a factor of safety of nearly five. This is a valuable feature of the suspension insulator, since in the case of one or even several of the disks being broken the remaining insulators in the set enable the line to continue operation without interruption.

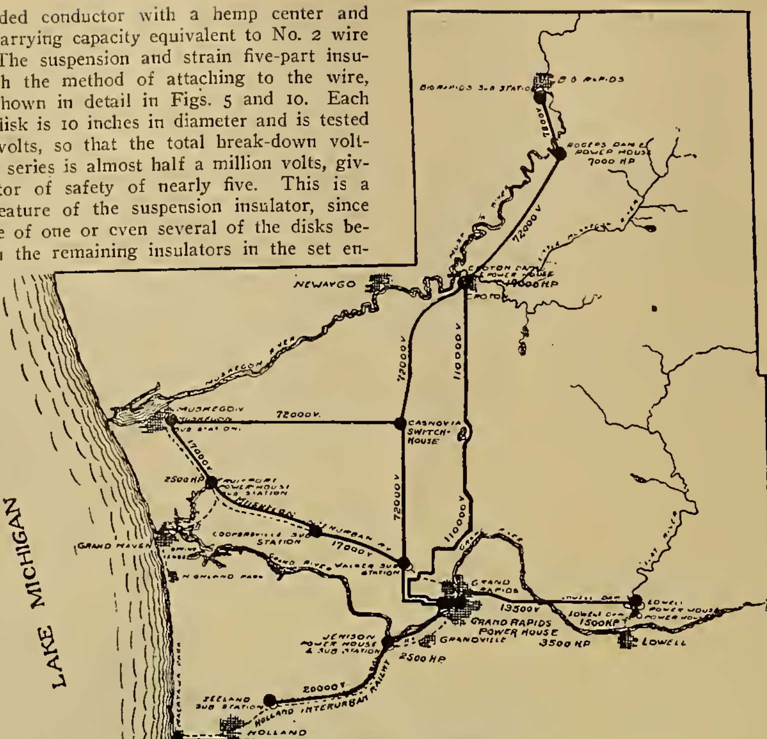


FIG. 4. MAP SHOWING TRANSMISSION LINES AND STATIONS OF GRAND RAPIDS-MUSKEGON POWER COMPANY

The photograph from which Fig. 1 was taken shows an interesting right-angle turn made by the use of the strain insulators on the 110,000-volt and the 72,000-volt lines near the city of Grand Rapids. Here the 72,000-volt pole line has been changed to the steel-tower construction for a short distance out of the city sub-station. The 110,000-volt wires are on the right or outer side of the turn shown in the picture. Fig. 9 shows a characteristic straight section of the line using the suspension type of insulators.

A 50-mile transmission line operating at the enormous potential of 110,000 volts presents some interesting and unusual electrical phenomena. Owing to the static discharge at this potential a continual noise or buzz is heard in the neighborhood of the high-tension line. This 30-cycle note can be heard distinctly at a distance of a hundred feet from the lines and is very noticeable compared with the silence of the 72,000-volt line near by.

In the dark the 110,000-volt wires appear luminous with a brush discharge distributed over their entire length. This luminescence is about of the quality of a rubbed phosphorous match, though at places where dust or some irregularity forms a discharge point a more brilliant brush display is produced. A night photograph of this 110,000-volt line was given on page 150 of the Western Electrician of August 29th, and Fig. 12 herewith is a reproduction of a two-hour exposure of the lines entering the Wealthy Avenue sub-station. Some idea of the scale of the picture is afforded by the distance between the wires, eight feet. The barbs of light due to localized brush discharges are well shown.

While 110,000 volts is the sustained line potential, even this value is often exceeded, for a range of a few thousand volts on the line is comparatively close regulation. At night the voltage is often held at 120,000 to 125,000 volts for the benefit of some 120-volt lamps on the system. With a slight swing of the voltmeter needle the brush discharge changes visibly, increasing in brightness out of proportion to the voltage change.

Ordinary effects of capacity and the line characteristics are greatly exaggerated in a line of such effective insulation and operating at this extremely high voltage. For instance, a slight wind blowing across the disconnected line serves to charge it to a very high potential. Whether from frictional electricity developed by the motion or from the drifting of charged masses of air or clouds against the line, sparks an inch in length may often be drawn. This was a troublesome cause during the construction of the system, as the linemen continually received slight shocks from the open line unless the wires were tied together and grounded.

In view of the present difference of opinion in relation to lightning protection the fact is worthy of note that the 110,000-volt line is provided with neither lightning arresters nor a ground wire. There are no operating switches in the 110,000-volt circuit, the high-tension windings of the two sets of transformers 50 miles apart being permanently tied together. The operation of this line without lightning arresters or ground wires has so far provided a record very encouraging to those who do not admit all the advantages of such protection. To date the 110,000-volt line has given less trouble, it may at least be said, than the 72,000-volt circuit which is provided with both arresters and a ground wire throughout its length; and the new line has already successfully weathered one of the most severe storms that ever visited the Grand Rapids region.

At the Croton power house the 7,200-volt primary circuits of the 110,000-volt transformers are controlled by Westinghouse 300-ampere type E oil circuit-breakers. With no further switching connection in the transmission circuit the three 3,750-kilowatt transformers at the Wealthy Avenue sub-station supply a 20,000-volt transmission line to the sub-station of the Grand Rapids, Holland and Chicago Electric Railway as well as the 7,200-volt station bus-bars connected to the downtown Grand Rapids sub-station. These enormous 110,000-volt transformers are shown in the interior view of the Wealthy Avenue sub-station, Fig. 8. A comparison of their gross dimensions with the chair in the photograph will furnish an estimate of their great size. They measure approximately 19 feet in height and 15 feet in diameter. The 110,000-volt primary terminals, which are plainly shown in the photograph, are connected in delta to the wires of the transmission line and carried overhead into the building. The oil switches which handle the 20,000-volt and 7,200-volt circuits are motor controlled and in accordance with modern practice are indicated on the switchboard by lamps.

FIG. 5. 110,000-VOLT STRAIN INSULATOR

As a matter of test, when the 110,000-volt line was finished building, but before connecting to the transformers at Croton, the dead-ended line was energized from Grand Rapids and the reversed readings of the station watt-hour meter taken. As an average of 52 hours a value of 152 kilowatts an hour was obtained, representing the total leakage and charging losses of the line and the exciting and other losses of the one set of transformers.

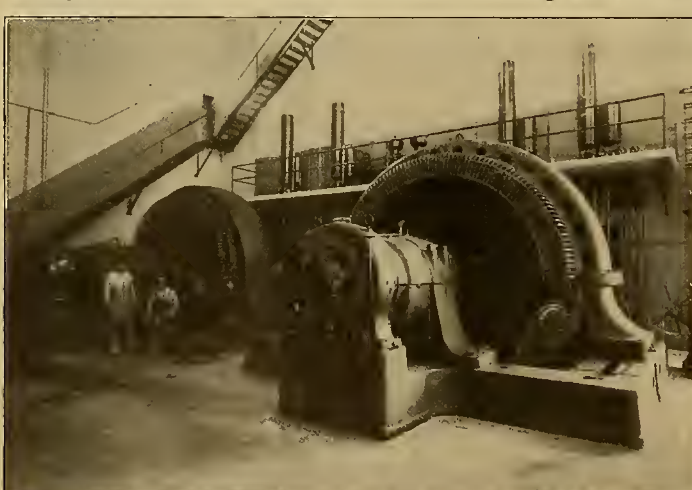


Fig. 6. 3,600-kilowatt Generators at Croton Dam

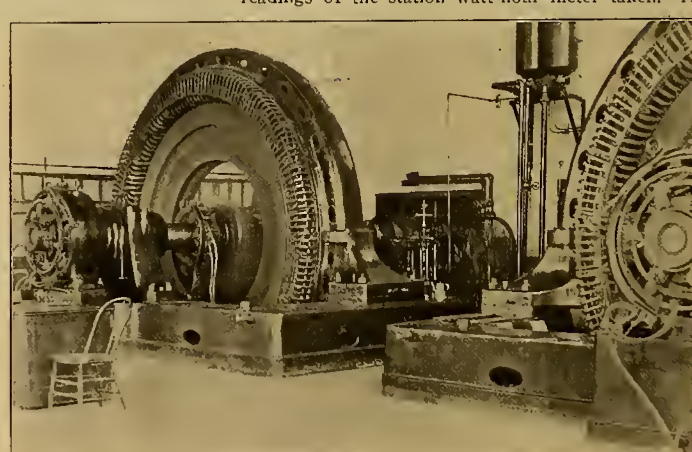
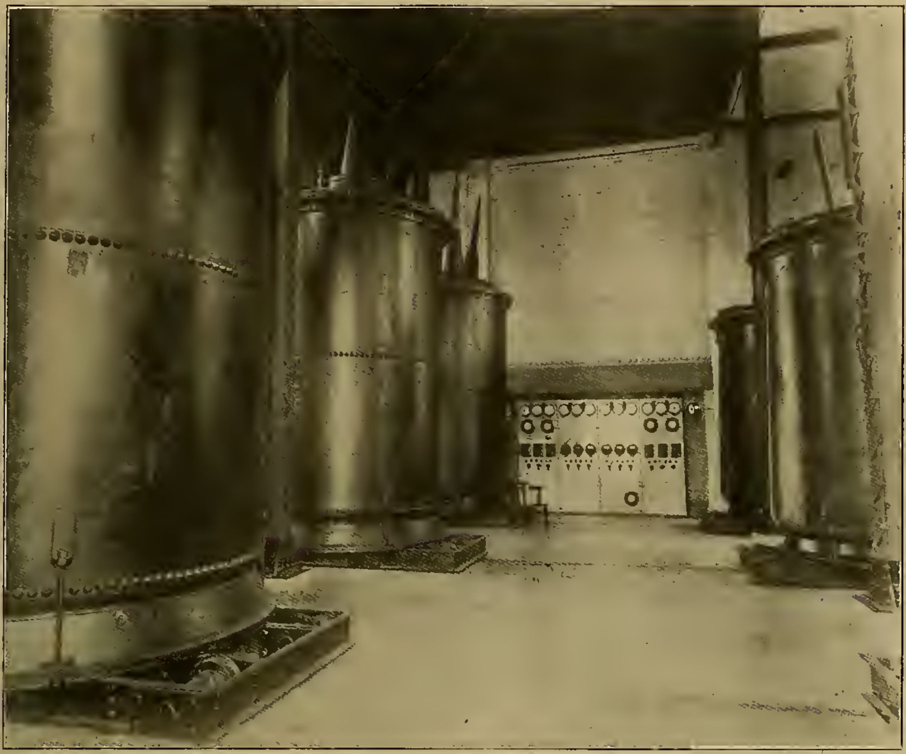


Fig. 7. Generators at Rogers Dam Power Plant

INTERIOR VIEWS OF GRAND RAPIDS-MUSKEGON COMPANY'S HYDRO-ELECTRIC POWER STATIONS

72,000-VOLT SYSTEM

The Wealthy Avenue sub-station, located across Grand River and a mile from the business center of Grand Rapids, also receives the 72,000-volt line originating at the Rogers Dam power house on the Muskegon River. The entrance of this line is shown at the left of the 110,000-volt wires entering the sub-station, in Fig. 11, and the 72,000-volt transformers may be seen at the right in the station interior, Fig. 8. Special 72,000-volt oil switches, designed by Mr. J. B. Foote, electrical engineer of the company, are inserted between the line and the transformer primaries, and type E 7,200-volt switches control the primary supply to the bus-bars, which are also energized from the secondaries of the 110,000-volt transformers. The 7,200-volt station voltage is transmitted to the downtown Grand Rapids sub-station at the corner of Fulton and Ellsworth streets, where it is made available for local distribution through rotary converters and frequency changers.



On the Left are the 110,000-volt Transformers, Stepping Down to 20,000 Volts and 7,200 Volts. The 72,000-volt Transformers are Seen at the Right

FIG. 8. INTERIOR VIEW OF WEALTHY AVENUE SUB-STATION, GRAND RAPIDS

Both sets of transformers in the Wealthy Avenue sub-station are mounted on trucks movable on transverse tracks so that any transformer may be run out into the middle passage under the travel of an electric crane of sufficient capacity to handle any part of the apparatus.

Referring to the map (Fig. 4), it may be explained that the 72,000-volt line into Grand Rapids is controlled from the Casnovia switch house which is the branch point for another 72,000-volt line to Muskegon, 26 miles west. The main 72,000-volt line passes the Croton station intact, leading directly to the Rogers Dam generating station.

The 72,000-volt line is carried on 14-inch four-part Locke insulators mounted on cedar and cypress poles, 40 to 60 feet in height, and placed 40 to the mile. Eighteen-inch wooden pins are used on tangents, and for curves galvanized steel-tube pins have a lead thread cast on the head to carry the insulator. The line conductor is of No. 2 medium hard-drawn copper. On one end of the five-foot upper cross-arm a ground wire of No. 6 galvanized iron is carried and grounded every fifth pole. The line is located on a private right-of-way four rods wide.

Rogers Dam Power Plant

The interior view of the Rogers Dam power house, Fig. 7, shows the two 1,500-kilowatt Westinghouse alternators generating 30-cycle current at 7,200 volts. Three 1,250-kilowatt, single-phase, 10-to-1 step-up transformers, arranged in delta, deliver this to the line at 72,000 volts. The city of Big Rapids, a short distance away, is supplied with power at the generator voltage, 7,200. The 72,000-volt transformers, together with their 72,000-volt, hand-operated oil switches, are placed in a separate building 50 feet from the power house.

The Rogers Dam plant operates at a head of 39 feet, which is utilized by two pairs of horizontal center-discharge Samson turbines in open steel-plate penstocks. The turbines are direct connected to the generators and controlled by Lombard governors. As at Croton, the exciters are mounted on the main shafts.

The Rogers Dam structure is foundationed on a line of steel piling driven into hard pan, and on which a 10-inch concrete core wall is reinforced. The waste-gate section has an over-all length of 150 feet and contains six tainter gates 20 feet by 12 feet flanking a six-foot log sluice. The gates are raised by one of two hoisting crabs which travel on a 24-inch gauge track and contain four-horsepower motors geared to winding drums. The crabs can exert an 8,000-pound pull, and in case of such an emergency as the breakdown of both motors or the lack of current, may be hand operated.

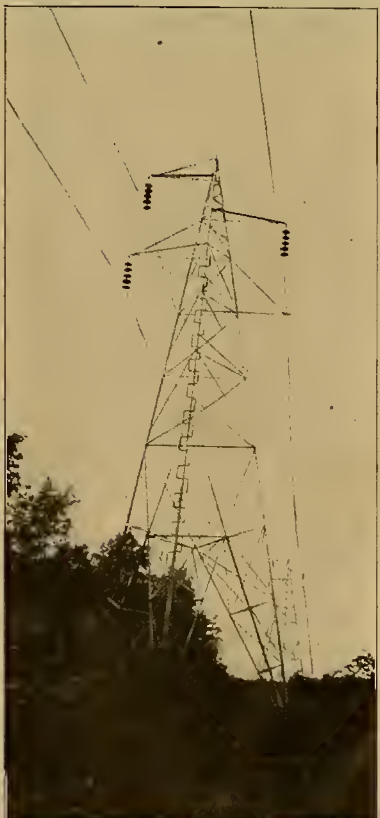


FIG. 9. 110,000-VOLT TRANSMISSION LINE, FROM CROTON DAM TO GRAND RAPIDS, SHOWING SUSPENSION INSULATORS

Down-stream from the gates is a tumble bay formed by an overflow weir. The retaining walls are extended 240 feet, forming a wasteway channel 180 feet wide.

Other lines of the Grand Rapids-Muskegon Power Company's system are the feeder transmission lines supplying the sub-stations of the Grand Rapids, Grand Haven and Muskegon Electric Railway with 17,000-volt current and the Grand Rapids, Holland and Chicago interurban road with 20,000 volts. At the Jenison power house on the latter line there is steam equipment driving two 750-kilowatt Westinghouse alternators also generating 30-cycle current. The Fruitport power house on the line of the Muskegon railway contains three 250-kilowatt double-current generators furnishing 650-volt direct current and 360-volt alternating current, and two 250-kilowatt, 650-volt, direct-current generators. In the Grand Rapids sub-station is a 500-kilowatt Curtis turbo-generator designed to operate at the system frequency of 30 cycles. Other older steam reciprocating auxiliary equipment located here may be impressed into service in case of line breakdown or low water.

A Pioneer High-tension Line

The transmission line now operating at 13,500 volts from Lowell to Grand Rapids was Michigan's first long-distance transmission of waterpower. The hydraulic development was begun in 1890 at Lowell on the Flat River, a tributary to the Grand, by the Peninsular Light, Heat and Power Company, which after several changes in control is now owned by the present Grand Rapids-Muskegon Power Company. The dam had a 12-foot head and a wheel capacity of 300 horsepower, a 180-kilowatt, 60-cycle alternator generated at 1,000 volts, and this was transformed to the transmission potential of 10,000 volts. The transmission at this pressure, 18 miles to Grand Rapids, was considered a wonderful achievement, although the pioneer high-tension constructors had to remove some prejudices before the public, and especially the public-governing bodies of that day, could be made to see the feasibilty of transmitting current for power over such a distance.

FIG. 10. 110,000-VOLT SUSPENSION INSULATOR

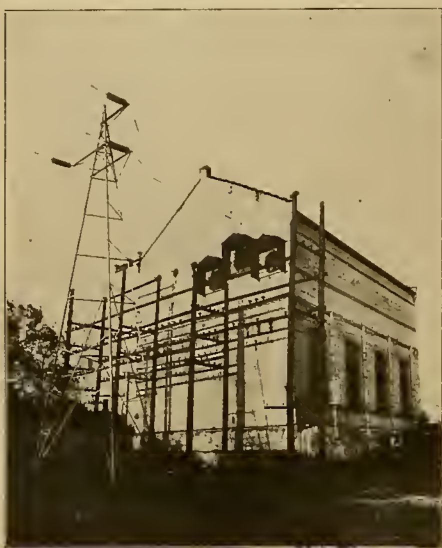
In 1903 the second dam on Flat River was built, giving a head of 30 feet and creating a 700-acre pond. This dam is 480 feet in length and has a waste-gate section 200 feet wide. Two 23-inch Samson turbines are direct-connected to 300-kilowatt, 13,500-volt, 30-cycle, three-phase generators, which are connected directly to the transmission line into Grand Rapids.

A small waterwheel in a canal diverted from the Grand River near the city of Grand Rapids, owned by the company, also develops enough power to make its operation of some slight service when the river flow is in excess of that required by other mill waterpower plants along the river.

Industrial Use of Power

Having thus shown itself a leader in methods of power development and transmission the Grand Rapids-Muskegon Power Company has made an equally aggressive and effective business campaign, with the result that the territory it supplies is most modernly equipped with household and business electrical service and electrical factory operation.

The plant of the Grand Rapids Plaster Company, one of the largest manufacturers of plaster products, is driven entirely by electric power purchased from the Grand Rapids-Muskegon Power Company. A total of 235 horsepower in 440-volt, 30-cycle induction motors has been installed. The gypsum is hauled from the mines by a windlass operated by a 20-horsepower motor and dumped into a hopper leading to a crusher driven by a



Grand Rapids Terminus of the 110,000-volt and 72,000-volt Transmission Lines
FIG. 11. WEALTHY AVENUE SUB-STATION

30-horsepower motor. Motor-driven conveyors transfer the crusher product to six mills, each operated by a 20-horsepower motor. The material is elevated, screened and fanned and finally conveyed to large kettles, where it is baked to drive out the moisture. These kettles, each having a capacity of 12 tons, are kept stirred by large paddles driven by a 40-horsepower induction motor. The installation is modern, circuit-breakers are used throughout, and the wiring is enclosed in steel conduit.

The Grand Rapids Hand Screw Company has a connected load of 210 horsepower of induction motors. These motors are largely direct-connected to the planers, lathes, saws, sanders, shapers and cut-offs. Meters are installed in each department and

Showing Luminous Discharge and Brush Displays. The Wires are Eight Feet Apart
FIG. 12. 110,000-VOLT SUB-STATION ENTRY AT NIGHT

the central-station service has brought out the following advantages over steam or isolated-plant power: Simplicity, economy of space, low initial cost, low operating cost and superiority in compiling records of power cost and production. The Fox Typewriter and Machine Company of Grand Rapids has a connected load of 190 horsepower in motors.

The new Muskegon factory of the Brunswick-Balke-Collender Company, manufacturer of billiard and bowling-alley equipment and other game devices, has a connected load of 1,250 horsepower in induction motors driving the many interesting automatic and semi-automatic machines used in the manufacture of its products. The Amazon textile and knitting mill at Muskegon is also operated from the power company's lines.

Electric Heating

A novelty in the way of hotel heating by electric radiators was introduced by the active solicitors of the power company a short time ago. The second floor of the Eagle Hotel, one of the oldest and best known in Grand Rapids, was equipped with electric radiators as an alternative to installing an expensive steam-heating system. As a result cheerful electrical heat is instantly available when required, and the guests seem delighted with the innovation. The cost is quite low, since the consumption of current continues only during actual use, and of course with waterpower generation the company is enabled to make favorable rates. Three heater units, each measuring 10 inches long by 3 inches in diameter, consuming 750 to 1,000 watts, are arranged for connection to plugs in each room. The hotel is further equipped with automatic electric switches on the doors of the refrigerator room controlling lights inside, metallic-filament lamps throughout, etc.

An unusually large number of electric flatirons and other heating specialties have been installed by the company.

Special Lighting Features

The accompanying night photograph, Fig. 13, shows the series tungsten lamp illumination on Canal Street, Grand Rapids, for which current is supplied by the power company. The installation consists of 15 spans of 18 pendent, 60-candlepower, 75-watt tungsten lamps in series on each span, the drops arranged in length to form graceful arches. The spans are 110 feet in width and 100 feet apart and cost for material and labor $50 each, or $750 in all. The Merchants' Association had the work put up so that the individual shares of cost were slight. The installation is permanent. The power company furnished the lamps and takes care of renewal and maintenance.

Grand Rapids has an unusual number of electric signs for a city of its size. With a population of 110,000 the Grand Rapids lines of the power company have a sign lamp for every five inhabitants. A record for new-business getting of 30 signs in 30 days was recently established.

FIG. 13. SERIES TUNGSTEN ILLUMINATION OF CANAL STREET, GRAND RAPIDS

The Show Room

The domestic use of electricity for illumination and heating has received a great deal of attention from the company, which maintains a handsomely appointed show room in connection with its business office at 47 Monroe Street, Grand Rapids. Handsome domes, shaded lamps, electroliers and other attractive lighting fixtures invite the passerby to a more extended inspection of the electric radiators, stoves, coffee percolators, chafing dishes, egg boilers, flatirons, hot-water bottles, heating pads, cigar lighters, etc. The business office of the Grand Rapids district occupies part of the lower floor and the second story is taken up with executive and general offices. The headquarters of the supervision and maintenance departments are in a concrete building newly erected by the company at Fulton Street and Ellsworth Avenue. This also contains the supply stores and Grand Rapids storage battery and is adjacent to the downtown substation and power house.

Personnel

The officers of the Grand Rapids-Muskegon Power Company are: President, Thomas Hume; vice-presidents, W. A. Foote, David D. Erwin; secretary, George L. Erwin; treasurer, J. G. Emery, Jr. H. W. Hillman is sales manager, J. B. Foote, the electrical engineer; W. G. Fargo, hydraulic engineer; A. F. Walker, general superintendent, and F. E. Greenman, assistant general superintendent.

REVIVAL OF KEOKUK PROJECT

A 400,000-horsepower hydraulic electric plant may be installed on the Mississippi River at Keokuk, Iowa, to furnish power and light to Davenport, Burlington, Rock Island and other manufacturing cities and towns in the district and eventually to St. Louis. The engineering firm of Cooper & Powelson has planned the development. Mr. V. N. Powelson of the firm was recently general manager of the Union Electric Light and Power Company of St. Louis. Mr. Cooper owns the government franchise to build the dam across the Mississippi River at Keokuk. He has constructed some of the great power plants at Niagara Falls and is a well-known hydraulic and electrical engineer.

WESTINGHOUSE READJUSTMENT

The readjustment committee of the Westinghouse Electric and Manufacturing Company has adopted substantially the merchandise creditors' plan, notwithstanding the fact that the cash subscriptions to the new "assenting stock" of $6,000,000, contemplated in the plan, do not exceed at this time $4,500,000, and although the assent of a large part of the bank debt still remains to be secured. The plan was adopted, however, with the understanding that it does not become operative unless the full $6,000,000 of subscriptions and the assents of the bank creditors are in hand by October 27th.

The readjustment committee, which is headed by Mr. James N. Jarvis as chairman, desires that it be distinctly understood that the readjustment will not be made until the full amount of the proposed $10,000,000 of assenting stock has been subscribed. The committee of merchandise creditors believes that the date set will see every dollar of the new stock subscribed.

The action, which was taken at New York city on September 24th, is considered the most definite movement yet effected to take the affairs of the company out of the hands of the receivers. The formal announcement of the plan and its terms and conditions will be made soon.

The original plan proposed by the readjustment committee early in the present year was for the issue of $35,000,000 of bonds to lift all the obligations of the company. After some work along this scheme, with little success, the committee of the merchandise creditors, headed by Mr. Joseph W. Marsh of Pittsburg, reported a plan by which $10,000,000 of assenting stock was to be issued. Of this the merchandise creditors agreed to take $4,000,000 for their claims, leaving $6,000,000 to be taken by the stockholders and bank creditors at the rate of 25 per cent. of their present holdings.

Thus far, 98 per cent. of the merchandise creditors' stock has been subscribed, but $1,500,000 of the $6,000,000 to be taken by the stockholders and bank creditors still remains unsubscribed, and a committee of the merchandise creditors will take in hand the work of getting in the lacking subscriptions. The readjustment committee's acceptance of the plan proves its confidence in its success by the date set.

INTERURBANS AND FARM VALUES

When the Indianapolis, Columbus and Southern Traction Company built its extension from Columbus to Seymour, Ind., it passed through the farm of A. G. Newsom. The matter of payment for the right-of-way was not settled at that time, as the road and the farmer could not agree. Recently Mr. Newsom brought suit against the traction company for $20,000 damages on account of the building of the line, which, he asserted, damaged his farm. Commissioners were appointed by the court to appraise the damage done, and they reported that a liberal estimate of the damage done would be $750. The commissioners said that a number of farmers testified that their farms had increased in value because of the interurban line, and that instead of being damaged farmers were greatly benefited by the road.

THE ELECTRICAL EQUIPMENT OF THE GREAT STEEL MILLS AT GARY, IND.

At the site of the city of Gary, on the sandy Indiana shore of Lake Michigan and 23 miles east of Chicago, a unique industrial achievement is at present in process of realization. A city, a harbor and an enormous steel works, the last the largest of its kind in the world, are being built in record time by the Indiana Steel Company, which has secured here a site of 9,000 acres, with a lake frontage of one and three-fourths miles, on which to erect both the mills and a residence city for its employes.

As the result of its design in advance to provide for indefinite expansion, the harbor of Gary will be one of the finest artificial ports and line of wharfage to be found anywhere, with almost no future limit upon unloading, shipping and storage facilities. Already the harbor includes a deep-water slip and a turning basin 750 feet in diameter, ample for the accommodation of the largest ore-carrying boats. Straight into the sand dunes a channel 250 feet wide, with a depth sufficient for the largest freighters, has been dredged as far as the straightened and deepened channel of the Grand Calumet River, and lined with concrete docks 62 feet wide. On the side toward the mills these extend for a mile, rising 10 feet above the normal water level.

Ore Docks and Unloaders

The plant for handling ore from the vessels consists of five Hulett unloaders and Hoover & Mason bridges of sufficient capacity to furnish material for the eight blast furnaces already built, each of which will deliver 500 tons of pig-iron daily, and the eight additional furnaces yet to be constructed.

From the time the steamer, with its 10,000 or 12,000 tons of cargo, reaches the harbor, every detail of handling the ore is a purely mechanical process. In his little house on the vessel-unloader one man, handling his controllers, does the work of several score under the old system of shoveling and hoisting. The clam-shell, designed to carry five tons, is dropped into the hold of the steamer, automatically seizes its load, raises it and swings it around, dumping into large concrete ore pockets at the rear. These unloading machines are all electrically operated.

From the pockets, which have walls eight feet thick with a concrete bottom five feet above the lake level, the ore is taken, as required, by grab buckets carried on motor trucks, operating on bridges 498 feet long. These bridges are the largest ever constructed, and rise to a height of 85 feet above the floor of the ore pockets. The clam-shells carry 14 tons at each trip, and convey the ore to hoisting bins, divided by concrete walls spaced 87 feet apart, which are built or laid out for nearly a mile parallel to the dock. These bins with the pockets at the water line have a present capacity of over 1,000,000 tons, sufficient to supply the furnaces during five months or more of closed navigation. With the completion of the bins this storage volume will be about doubled. By means of auxiliary ttrack facilities, provided for handling ore in and out of cars the entire system is also rendered exceedingly mobile. From the bins the ore is taken by electrically-operated larries and hoisted on skips to the tops of the blast furnaces.

Power from Blast-furnace Gas

The plant at Gary is unique in deriving, as it does, all of its power from the waste gases of the blast furnaces. The plans call for 16 blast furnaces in all, and of these eight are finished or under construction. These furnaces are interesting in their incident role of gas-producers, now furnishing their former waste material as fuel for the operation of gas engines driving electrical generators and machinery.

In making pig-iron, coke, ore and limestone are put in layers in the blast furnaces, the fires are lighted, and a powerful blast of heated air is sent through the burning material, generating heat sufficiently intense to melt the ore and the limestone or "flux" into a molten mass. In burning the coke under the forced draft some of the heat energy remains unconsumed despite the best engineering skill exerted to make the gas as "lean" as possible, and the products of incomplete combustion pass to the top of the furnace. The old way, in the early days of making iron, was to let this fuel escape into the atmosphere; later, a portion was caught and utilized for the generation of steam, and now the entire volume of this waste is, for the first time, to be made profitable on a large scale.

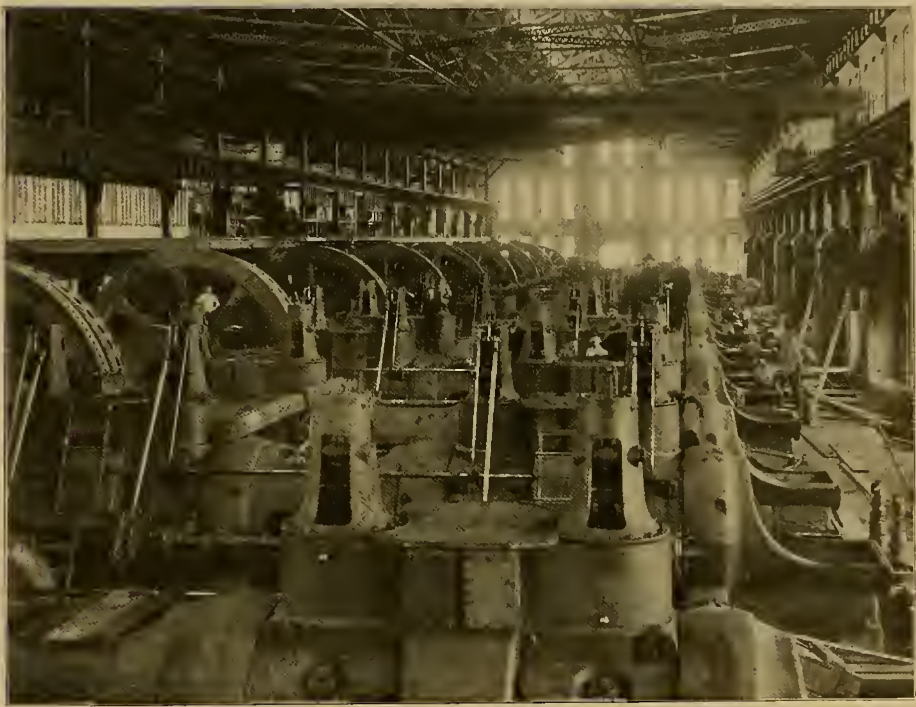
Except for various auxiliary purposes, and as a reserve in case the blast furnaces are shut down, steam has no place in the new mills. There remains enough calorific value in the tunnel-head gases of a 500-ton blast furnace, such as the Indiana Steel Company uses, to extract about 30 per cent. for heating the stoves and still leave a tremendous volume of gas available for power. It has been demonstrated by smaller installations both here and abroad that with the utilization of gas engines, batteries of blast furnaces can be depended upon to develop enough power for all of the mill purposes, making the entire plant, except for ore, coke and limestone, literally "self-contained."

The most interesting feature of the blast furnaces, perhaps, is the link connecting them with the power station and blowing engine houses—the gas cleaning plant, which immediately adjoins the furnaces and stoves.

Cleaning the Blast-furnace Gas

When the vast volume of dust-filled gas is blown to the tops of the blast furnaces, it passes from each, through four outlets, into two large pipes known as "downcomers," which lead into a reservoir, 30 feet in diameter by 40 feet high, called the "dry dust catcher." There most of the impurities settle and the gas passes into supplementary tanks 14 feet in diameter by 25 feet high, one of which serves each pair of furnaces. These structures provide an additional dust-catcher and also act as a valve, being divided into two compartments partially filled with water. By increasing the height of the water in either one, the furnace on that side can be cut off as desired, and there will be no back flow of gas from the mains beyond. The two chambers of this tank discharge into a pipe 10 feet in diameter, which carries the gas and remaining impurities into the primary "wet" washers. There are three of these to each pair of furnaces and each has capacity sufficient to take care of the gas from a single furnace, thus providing a spare washer for use while one is being cleaned or repaired. The primary washers are cylindrical in form, with cone bottom and cone top, and are about one-third full of water, a proper overflow maintaining the required level. Here the gas and dust are discharged against the surface of the water from pipes with fluted edges. At this point a small percentage of the gas is diverted to special furnaces under a battery of Rust boilers used for making steam, and about 30 per cent. is taken for heating the stoves. The remainder continues on to the secondary washers. First of this group are the vertical scrubbers—drums about 14 feet in diameter by 50 feet high—through which the gas and water are passed in opposite directions. The gas then passes into Thiesser washers of which there are four to each pair of blast furnaces. In these it is led between the wall of a cylinder and a revolving drum armed with a series of paddle-like blades. The whirling drum throws the remaining impurities of the gas against a water film on the cylinder. From these final washers the gas is conveyed under slight pressure to the holders, each of which has 200,000 cubic feet capacity, from which it goes, as required, to the electric power station and blowing engine houses. The water for the various processes described above is furnished by four large Platt turbine pumps.

Sixteen blast furnaces produce about 44,900,000 cubic feet of gas per 24 hours, equivalent, when used in gas engines, to 500,000 brake-horsepower. Of this quantity approximately 30 per cent. is taken for heating the stoves, 7½ per cent. is diverted to steam boiler furnaces, five per cent. is consumed by various auxiliaries or lost in the process of cleansing, 12½ per cent. operates the gas engine-driven blowers, and 45 per cent. supplies the electrical power station.



PART OF A ROW OF 17 4,000-HORSEPOWER GAS ENGINES, USING BLAST-FURNACE GAS, DIRECT-CONNECTED TO ELECTRIC GENERATORS, AT GARY, IND.

The Power Plant

The power station, which is 966 feet long and 105 feet wide, with 42 23-foot bays, is located immediately adjacent to the blowing-engine houses and between the blast and open-hearth furnaces. This places it advantageously for fuel supply and insures minimum lengths of transmission lines to the various departments using electric power.

In this central station are installed 17 horizontal, twin-tandem, double-acting gas engines, turning at a speed of 83⅓ revolutions per minute, 15 of which are designed for coupling to alternating-current generators and two to be connected to direct-current generators. The former are 25-cycle, three-phase, 6,600-volt machines, and the latter deliver current at a pressure of 250 volts. The engines have a rating of 4,000 horsepower and the generators 2,000 kilowatts, but they are capable of carrying continuously 30 per cent. overload. The 17 units were built complete by the Allis-Chalmers Company and are the largest engines in the world operating on blast-furnace gas.

The floor space occupied by one engine is 70 feet by 44 feet, and the weight approximates 1,700,000 pounds. The cylinders are 44 inches by 54 inches stroke, the crank pins are 20 inches in diameter, the shaft is 30 inches in diameter in the bearing, and the flywheel is 23 feet in diameter,

[*Continued on page 254.*]

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

READERS of the Western Electrician will appreciate, we are sure, the serial on "Alternating Currents and Their Applications," begun in this issue. The author is Mr. Edson R. Wolcott, formerly professor of physics and electrometallurgy in the Colorado School of Mines but now engaged in practical electrical engineering work in Chicago. He has struck a happy medium, we believe, between the elementary and the abstruse, and has produced a work of practical value and usefulness which will run through some forty issues of this journal. There are to be ten chapters divided into forty sub-heads and a much larger number of sub-sub-heads. The chapter headings are: "General Principles," "Generators," "Motors," "Transformers," "Rotary Converters and Motor-generators," "Lighting," "Thermal Applications," "Transmission," "Switchboards and Regulation," and "Summary." This list gives an idea of the comprehensiveness of the series. It may be added that over 200 diagrams and other illustrations will be used to elucidate the text.

FALL TRADE prospects are discussed in a symposium of views of electrical men of prominence, given in this issue. These expressions of opinion will be found to be interesting reading, and while it is true that a strong sentiment of caution and conservatism is shown, yet on the whole it is fair to say that the general trend of opinion of these representative electrical men is hopeful and encouraging. The situation is complicated not only by the recent slackening of business but also by the uncertainties of a presidential campaign. However, the future is faced with entire confidence by men who realize that "times are what we make them;" that the way to resume is to resume, and that a stout heart and a clear head render the merchant and manufacturer immune from the bacillus of panic. To this type of sane, level-headed, continuous business builders we believe the commercial electrical fraternity, as a class, belongs.

A STRIKING ASSERTION is made in one of the circulars of the United States Forest Service, and that is that under average forest conditions it requires more than 190 years to grow a 30-foot white-cedar telephone pole. Yet the average life of such a pole, when set in the ground in its natural state, does not exceed 15 years. In other words, in order to meet even the present annual consumption there must be nearly 13 trees growing in the forest for every 30-foot cedar pole standing today. But poles can be made to last 20 or 25 years by a simple treatment of their butts with wood preservative. Furthermore, fire-killed or other dead wood standing in the forests can be treated by preservative to be made durable and useful. Hence, the government considers the subject of wood preservation highly important. Creosote and zinc chloride are used to impregnate the wood. Both are excellent antiseptics. Zinc chloride is the cheaper, but creosote is superior in that it is insoluble in water and will not wash out of the timber.

The subject of wood preservation is worthy of careful attention. The Forest Service has made a careful study of the subject and will be glad to send information on request.

THE American Association of Electric Motor Manufacturers, recently formed, listened to some practical papers at its fall meeting at the Thousand Islands, briefly reported in the Western Electrician of September 19th. Two of these related to the ratings and guarantees of motors, one being devoted to alternating-current motors and the other to direct-current machines. This is an important subject, touching as it does the matter of standardization of electrical machinery.

Taking a 10-horsepower direct-current motor, for example, why should not all the manufacturers agree to a uniform design as to speed and dimensions? Then the maker of a motor-driven machine could design his apparatus so that any electric motor of the desired type and capacity could fit into it. As it is, the distance from base to center of shaft, say, as well as the revolutions per minute, vary, so that the machine builder is forced to design his product for one particular type of motor. It is often desired to substitute one make of motor for another, perhaps quickly, as in case of accident, and this could be easily done, if all electric motors were standardized.

To such desirable improvements in the art as these the American Association of Electric Motor Manufacturers may well devote its attention.

GRAND RAPIDS, Michigan, is sometimes called Furniture City from one of its conspicuous industries; but to the electrical man it contains so many features of unusual interest that it may deserve another sobriquet. One of these developments is a 72,000-volt transmission from a waterpower 68 miles away. Until a short time since this installation, the achievement of the Grand Rapids-Muskegon Power Company, remained the highest operating transmission voltage in the world.

Ten weeks ago the engineers of the same company, emboldened by the success of the 72,000-volt line, put into operation at its designed pressure the line they had planned for 110,000 volts. As related elsewhere in this issue, the 110,000-volt transmission line has given a clean bill of performance to date and has shown by its good behavior that the limit has not yet been reached.

When one considers that the potential of 110,000 volts is almost double the voltage on any other operating transmission system he cannot but admire the enthusiasm and faith of the engineers whose pioneer experiment with a working transmission of this voltage faced the expense and possible loss of the special apparatus and material required for a 50-mile steel tower line with transforming equipment. To take the untried step demanded enterprise that has been justified by success. Now that 110,000 volts has been proved a feasible working potential, other lines at a similar voltage are being built, and it is likely that the Grand Rapids line will not long retain its unique position. Meanwhile some of the engineers for the company who have watched the operation at 110,000 volts are convinced that this working potential may be doubled; they look upon 200,000 volts as the next step in the line of progress.

In the operation of 50 miles of transmission line at 110,000 volts and often reaching 125,000 volts for special purposes, some difficulties, both expected and unlooked for, are encountered. For instance, 110,000 volts has an extreme disruptive gap of about 10 inches. The necessity for absolute insulation and a wide separation of the wires is evident. Even the open line wires hiss with a static discharge that is visible in the dark as a solid glow studded with brush barbs.

As interesting as the generation and transmission of the current has been, its marketing by the company is no less so. Numerous factories near Grand Rapids and Muskegon, equipped with electric motors, derive all their power from the lines of the company, and the steady, dependable service of a transformer has been substituted for an expensive steam power plant. In the domestic and lighting fields the Grand Rapids company has some enviable records and has pushed the sale and use of electric signs and household heating appliances until the city enjoys electric conveniences as numerous and complete as any in the country.

The commercial success of the service is largely to be attributed to the economy secured by the use of waterpower, and, as the Western Electrician has previously pointed out, there are many other cities where a like advantage may be taken of hydraulic possibilities within a reasonable length of transmission. It is interesting to reflect, also, that the excellent performance of the 110,000-volt line is no doubt due mainly to the invention of the suspension insulator.

The engineers of the Grand Rapids-Muskegon company are to be congratulated on their noteworthy accomplishment. They have brought appreciably nearer that diffusion of cheap electric current to which Dr. C. P. Steinmetz alluded when he said he hoped to see the day "when 100,000 volts can be taken into the backyard of anyone who wants to buy power."

TIMELY SUGGESTIONS

By Frank W. Frueauff,
Vice-President and General Manager Denver Gas and Electric Company

The fall and winter season of 1908 seems to present more matters for the attention of central stations than is usual at this time of the year.

The depressed condition in many parts of the country has resulted in the practice of unusual economy, which has been effected at the expense of some part of the system. Such economy can only be properly practiced for a short time, and before the station is again loaded up, all parts of the apparatus ought to be given special attention and overhauling. Wherever repairs have been neglected, the plant ought to be put in excellent condition, for at this time of the year interruptions to the service cannot be countenanced.

We should look over our transformers and see that they are in first-class shape. Give careful attention to consumers' accounts, and if they seem out of the way, investigate the consumers' meters and see whether they are out of order. In overhead systems, see that the slack is taken out of the loops and that we are prepared for the winter storms.

With the return of confidence, which is more and more evident, the prospects for securing new business seem much brighter, and a special effort ought to be made to increase the display lighting of the merchants. There are, at this time, splendid power prospects and opportunities to shut down isolated plants.

In the residence section, now is the best time to stimulate the use of electricity for lighting, or, where already in use to have men go over the installation and see that all parts of it are ready for service this winter. The use of the various household appliances can best be pushed now; sewing-machine motors, electric flatirons, porch lights, chafing-dishes, and so on, will again be in demand.

FALL PREPARATIONS AT THE CENTRAL STATION

By L. D. Mathes,
General Manager Union Electric Company, Dubuque, Ia.

In discussing preparations for the fall and winter campaign of the central station the writer will not consider a possible tuning-up of the generating plant itself, but rather the broader aspects of the question, particularly the plans which are being adopted to secure increases to the connected load.

We are fortunate in having a new station and of such capacity that there is at this time no thought required concerning ability to handle the winter peaks. In our opinion the central station, from a mechanical point of view, should require no more preparation at the beginning of winter than at any other season. In other words, the question of maintenance should be given constant attention, and the plant always should be capable of its greatest possible efficiency.

There has been a wide difference of opinion among central-station managers concerning the policy to be followed in the conduct of the new-business department during that period which is generally referred to and acknowledged as one of depression in industrial circles. This company has inclined to the opinion that in times of lessened activity in commercial circles the greatest effort is required on the part of the central station to hold the business in hand as well as to secure additional connected load. It is readily to be seen that when general prosperity is abroad in the land business is much more easily secured than under conditions such as have prevailed for some months past. We have found a marked inclination on the part of our customers to retrench; many manufacturers who are power consumers have reduced their output to correspond more closely with actual orders in hand. The loss which we suffer in this direction must be made up by securing new business of the same or, if possible, greater volume.

On June 1st we put on an as an addition to our soliciting force a high-class solicitor, who gives his entire attention to power and sign business. Despite the inclination of the manufacturers to go slow, the power solicitor has been able to show such marked economy of operation through the introduction of motors that a number of desirable installations have been secured.

There has also been some progress made in the sign business. In order to strengthen the campaign we required additional newspaper space. A deal was consummated with the two daily papers whereby we increased our advertising contract for 12 months $2,000. Each of the papers contracted at the same time for an electric sign, the cost of the sign and the same, with flat-rate service schedule included, being $1,000 each. The paper bills us each month for the space which we pay for in cash, we in turn billing the paper for one-twelfth of the cost of the sign and service every 30 days, receiving their check therefor. This occurs to us as being an excellent arrangement all around. For one thing, it stimulates the merchants to advertise in the papers through noting the increased space occupied by the electric company, admittedly one of the most aggressive advertisers, while, from our point of view, the adoption of electric signs by the newspapers will have a strong moral influence on those to whom we are endeavoring to sell signs.

By special engagement we have in our service for 60 days a tungsten-lamp expert who is making a personal canvass in conjunction with our solicitors. Most satisfactory results have followed, a number of desirable customers having been secured and a considerable number additional being in immediate prospect.

To summarize: We have increased our expenditures for soliciting and advertising several thousand dollars a year, and the business is increasing in a greater percentage than at the same time a year ago.

In addition to the newspaper space we occupy, we are following the well-worn path of circular letters and printed matter of attractive design which comes to us from our friends the manufacturers. We feel that now is the time when the greatest activity and most liberal policies are necessary on the part of central-station management if results should be shown at the end of the year which will not be unfavorable as compared to this time a year ago.

PLANNING FOR AN ACTIVE FIGHT

By Emil G. Schmidt,
General Manager Springfield (Ill.) Light, Heat and Power Company

We are spending about $30,000 in building an extension to our boiler plant, which includes a concrete stack 200 feet high by 11 feet in diameter, and two 500-horsepower boilers. The company has also made extensive improvements in its steam and hot-water heating systems, which departments show an increase in business of about 10 per cent. over the previous year.

Although our commercial lighting and power business has barely held its own during the summer months, we expect a normal increase this fall and are preparing to wage an active fight against gasoline competition with tungsten lamps and Holophane fixtures.

Our new-business department has placed a great number of signs, which are sold on a one-year or two-year contract, with monthly payments covering the cost of the signs and current on a flat-rate basis.

We have also closed a power contract with a large manufacturing plant that has recently moved to this city, and are making a special effort to secure daylight power contracts in order to straighten our load curve.

A NEW NORTHWESTERN ASSOCIATION

A preliminary step toward a big convention of electrical men representing the power and lighting interests of the Northwest during the coming Alaska-Yukon-Pacific Exposition at Seattle, Wash., was taken in that city late in September, when delegates from Washington, Oregon and Idaho met and formed the Northwest Electric Light and Power Association. Arthur Gunn of Wenatchee was elected temporary chairman and J. D. Gray of Aberdeen, temporary secretary.

Following the business sessions several entertainment features were tendered the delegates. Special cars took them on a tour of the city visiting the plants of the Seattle Electric Company and later a banquet was given by the Seattle Electric Company and the Seattle-Tacoma Power Company.

Permanent officers of the association were elected as follows: President, Arthur Gunn, Wentworth, Wash.; vice-presidents, A. Welsh, Portland, Ore., F. Rotsch, Fairbanks, Alaska, Henry Adams, Lewiston, Idaho; executive committee, I. W. Anderson, Walla Walla, Wash.; L. B. Faulkner, Olympia; C. G. Arrowsmith, North Yakima, Wash.; O. B. Caldwell, Portland, Ore., and N. J. Shields, Mos- Idaho.

ELECTRICAL INDUSTRIES OF THE PACIFIC SLOPE

In the states of California, Nevada, Oregon and Washington and the territory of Arizona that may be grouped as the Pacific Coast region there is a total of 876 companies devoted to the generation, transmission, distribution and utilization of electric current for light, power or traction purposes. Their combined output is 731,487 kilowatts now actually generated or in process of installation for that purpose.

As classified by the Western Electrical and Gas Directory, just issued by the Blanchfield Publishing Company of San Francisco, the relative amounts of electric power generated through steam engines, water wheels and gas engines and the relative generation as alternating current and direct current all expressed in kilowatts are given in the table below:

	Electric Power Generation.			Relative A. C and D. C. Generation.	
	Steam.	Water.	Gas.	Altern. Current.	Direct Current.
Arizona......	7,102	15,650	1,120	21.527	2,345
California...	156,539	347.735	16,569	495.127	25,716
Nevada......	1,750	17.500	237	19,427	60
Oregon.	17 652	25,601	50	40.675	2,628
Washington..	28,517	95,085	380	119,250	4.732
Totals	211,560	501,571	18,356	696,006	35,481

The totals clearly indicate that hydro-electric power is the predominating kind of electric power in this region. Furthermore, the great contrast between the amounts of alternating current and direct current generated show that the Pacific Slope is the great electric power-transmission zone in this country.

WIRELESS CONTROL OF CARS

One of the most interesting papers read before the Central Electric Railway Association at Indianapolis on September 24th was presented by Dr. Frederick H. Millener of Omaha, whose experiments at the Omaha shops of the Union Pacific Railroad on the remote control of cars have attracted wide attention. (See Western Electrician of April 25, page 329, and May 9, 1908, page 360.) Dr. Millener's subject was "The Mechanical Application of Wireless Telegraphy to Railroads." He told of his experiments toward the control of a small storage-battery car, showing how he had been able to start and stop the car, regulate it to four speeds, or start it forward or backward by means of the wireless waves. He stated that he had also been able to ring a bell on the car while in motion without interfering with its speed or disturbing the receiving stations which regulated the speed. The practical operation of such a system, he explained, would be for giving warning to the engineers of trains or motormen on electric railways. He explained that by means of "wireless" an apparatus in the cab can be operated to turn on a light, ring a bell and throw an indicator to "danger." He also said it was possible to give one engine such a signal without affecting other instruments. He has operated the system successfully for a distance of five miles and is confident that it can be extended for 50 miles or more.

ELECTRICAL STUDIES IN PUBLIC SCHOOLS

During the coming winter the Philadelphia public-school management will conduct a municipal school of electricity, and Chief McLaughlin of the Electrical Bureau is having built a completely equipped laboratory for the use of the boys. The scheme for giving semi-weekly lessons in electricity includes instruction in the principles of arc lighting, incandescent wiring and lighting, the laying of cables, the construction and working of power plants and other branches of electrical work. In general, the plan is to help the youth of the city to a more practical knowledge than they can hope to obtain with the limited facilities afforded them in the schools.

COMMUNICATION

SYMBOLS FOR PHYSICAL QUANTITIES

To the Editor of the Western Electrician:

Now that there has been some opportunity for discussing this question, may I be permitted to summarize the arguments that have been raised for and against the creation of new symbols?

The most common objection is "They are like Chinese characters; we could never remember them." But there will be no necessity to remember them. How many of us can remember what symbol Rankine uses for kinetic energy? Is it not sufficient if we see it when we refer to his book? Every considerate writer today gives a list of the symbols he uses. If all writers used the same symbols, we should soon become familiar with those with which we are most concerned, and for the rest we could refer to the list just as at present.

Some objectors do not see why the letters we have at present are not sufficient. Let them try to make a list of symbols for the 200 physical quantities for which symbols are wanted. After they have made up such a list (if such a thing is possible) to satisfy themselves, let them try to convince someone else to adopt that list.

There are about 20 letters, such, as *m* for "mass," *t* for "time," etc., upon which there is almost universal agreement. One or two dozen more stand a fair chance of being agreed upon. Beyond these, there is hopeless confusion, simply because all the good letters are exhausted.

As to the difficulty of printing new symbols, it is of interest to know that 25 of the leading technical journals of the world published an article containing five new symbols given as examples without any difficulty. Several of them have expressed the view that there is no difficulty from the printer's point of view. The types supplied to them (which, by the way, cost 1d. for 30) were all of one size, and yet each paper used for the text of the article its usual standard type. The publisher of the Elektrotechnische Zeitschrift thinks that there would be no difficulty in arranging with a type founder to make matrices, from which all printers could be supplied with type. Each printer would keep in stock those types which commonly occurred in his paper, and could get others on short notice. About 30 new symbols would be sufficient for articles on electrotechnical science.

Two papers have objected that the symbols cannot be set up on a linotype machine. It is, however, usual at the present time to set up mathematical expressions by hand.

Several critics have pointed out that the new symbols should be simple and bold in outline, so that they cannot be easily mistaken for one another. This, of course, is an important matter to bear in mind.

I agree with Mr. Galliot that the name of the symbol should be, where possible, the name of the physical unit represented. Where the name of the unit cannot be employed, a word of one syllable might be chosen, as, for instance, "stroke" for the length of a piston stroke.

Some critics say that the number of symbols required would be too great. As to that, we can make just as many as convenient. The symbol ~ became universal almost as soon as it was printed. Let us have a few more as good as that one; we are badly in need of them.

MILES WALKER.

The Cottage, Leicester Road, Hale, Cheshire, England, September 19, 1908.

NEW YORK ELECTRICAL SHOW

The New York Electrical Show opens at Madison Square Garden, New York city, October 3d, and will continue until the 14th. All arrangements for the exhibits and features have been completed. George F. Parker is the general manager and the following committees are in charge:

General Advisory Committee—T. C. Martin, chairman; E. G. Acheson, J. C. Barclay, J. F. Becker, Theodore Beran, John Bottomley, W. W. Bradfield, E. Caldwell, George Clapperton, Prof. F. B. Crocker, Minor M. Davis, Dr. C. A. Doremus, Stephen D. Field, Frank H. Gale, Prof. A. F. Ganz, Bancroft Gherardi, Francis W. Jones, T. Inslee Jones, Dr. A. E. Kennelly, Max Loewenthal, William Maver, Jr., H. K. McCann, J. C. McQuiston, P. S. Millar, W. T. Morrison, Dr. F. A. C. Perrine, A. A. Pope, R. W. Pope, Dr. E. F. Roeber, C. F. Scott, Dr. Clayton H. Sharp, Dr. C. P. Steinmetz, L. B. Stilwell, H. G. Stott, P. Torchio, W. C. Webster, W. F. Wells; G. H. Guy, secretary.

Submarine Cables—Dr. A. E. Kennelly, William Maver, Jr., George Clapperton, J. C. Barclay, H. G. Stott, E. Caldwell.

Historical Lighting—A. A. Pope, W. T. Morrison, W. F. Wells, T. I. Jones, J. F. Becker, Dr. C. H. Sharp.

Electrochemistry—Dr. E. F. Roeber, Dr. C. A. Doremus, Prof. F. B. Crocker, P. Torchio, Dr. F. A. C. Perrine, C. F. Scott.

Reception Committee—W. F. Wells, H. McL. Harding, P. S. Millar, Theodore Beran, J. C. McQuiston, F. H. Gale, R. W. Pope, John Bottomley.

Lecture Committee—Max Loewenthal, G. H. Guy, T. I. Jones, H. Harding, Professor Ganz.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION

The sixth annual meeting of the Colorado Electric Light, Power and Railway Association was held at the Hotel Colorado in Glenwood Springs, Colo., on September 16th, 17th and 18th. There were about 30 representatives of active company members present and about 35 representatives of associate-member companies.

President W. G. Matthews opened the meeting Wednesday afternoon by reading the annual address of the president. S. E. Doane of the National Electric Lamp Association, Cleveland, Ohio, read the first paper, entitled "The Newest Incandescent Lamps." This was followed by considerable discussion on tungsten lamps. At the evening session a paper on "The Operation of Hydro-electric and Steam Plants in Parallel" was read by J. C. Lawler of the Colorado Springs Electric Company.

On Thursday morning John M. Mulvihill of the Denver Gas and Electric Company presented a paper on "Popularizing of Public-utility Corporations by Careful, Painstaking Office Management." Geo. R. Hall read his paper on "Electrification of Steam Railroads Operating in Mountainous Districts."

Friday morning was devoted to the reading and discussion of three interesting papers, "Lightning-arrester Equipment on the Animas Power and Water Company's System," by John A. Clay of that company; "The Westinghouse Nernst Lamp—Its Value as a Business Getter for Central Stations," by A. L. Eustice of the Nernst Lamp Company, and "Some Notes on Single-phase Railway Systems," by Clarence Renshaw.

The entertainment features consisted of a trip in a special train at two o'clock Friday afternoon to the workings of the Central Colorado Power Company, at Shoshone, on the Grand River, 11 miles from Glenwood Springs. A thorough examination of the dam, tunnels, building sites, tower construction, etc., was made. Thursday night was given up to a rejuvenation of the Sons of Jove.

For the ensuing year the officers elected were: President, J. F. Dostal, Denver; vice-president, W. T. Wallace, Canon City; secretary and treasurer, J. C. Lawler, Colorado Springs. Additional members of the executive committee: George B. Tripp, Colorado Springs, and W. G. Matthews, Denver. Advisory committee: John A. Beeler, Denver; W. J. Barker, Denver; John F. Vail, Pueblo; C. K. Durbin, Denver; J. A. Cooper, Denver. Membership committee: L. M. Cargo, Denver; J. C. Davidson, Denver; C. H. Williams, Denver. Finance committee: Irving Hale, Denver; John A. Clay, Silverton; W. P. Eyre, Buena Vista.

VERMONT ELECTRICAL ASSOCIATION

On September 16th and 17th the Vermont Electrical Association held its annual convention at Bennington, Vt. The program was rather brief and was opened by President E. E. Larrabee's address, in which he emphasized the commercial side of the central-station business. A paper by H. C. Rice of Cleveland, O., on "The Tungsten Lamp and Its Effect Upon the Smaller Central Station" was then read and discussed.

In the evening Frank B. Rae, Jr., of New York, read a paper on "Commercialism." Mr. Rae spoke of the commercial problems of selling electricity as already of more importance than the technical questions involved, since the latter have been mostly solved. Commercialism he defined as embracing public policy, general management, soliciting and advertising. Supplementary to this paper George Williams of New York showed and described a large number of lantern slides of successful examples of street, outline and sign lighting.

Glenn Marston of New York spoke on "Public Policy" and T. Commorford Martin of New York on "State and National Electric Light Associations," in which he advocated co-operation with the National Electric Light Association. The election of officers for the coming year resulted in the choice of the following named: President, F. H. Parker of Burlington; first vice-president, Jas. E. Davidson of Montpelier; second vice-president, C. E. Parker of Vergennes; secretary-treasurer, A. B. Marsden of Manchester.

CENTRAL ELECTRIC RAILWAY ASSOCIATION

The first fall meeting of the Central Electric Railway Association was held in the Claypool Hotel, Indianapolis, on September 24th. The meeting was called to order by the president, F. D. Carpenter of Lima, Ohio. After the reading of the minutes by the secretary, A. L. Neereamer, seven new members were admitted.

The first paper on the program, "Benefits of the Index Bureau," was read by E. C. Carpenter, claim adjuster for the Indiana Union Traction Company, Anderson, Ind. The plan of the bureau is to keep a card index of all claimants for damages, the nature of their injuries and a complete abstract of the circumstances upon which their claims are based. By the use of such system the "fake" claims have been reduced very largely.

The next paper, on the subject of "Recent Developments of Lightning Arresters," prepared by D. B. Rushmore of the General Electric Company, was read by T. A. Worcester of the same company. Mr. Worcester said that lightning protection is essential up to the point where it ceases to effect a saving; where the cost of lightning protection is greater than any probable loss the protection ceases to be economical. There are cases, however, where for special reasons absolute protection is requisite at any cost. According to the writer, graded resistance or aluminum-type lightning arresters should be installed on every feeder issuing from the station and on every transformer as well as a surge protector in the station, but choke coils having a large number of turns should not be used in the station, as they represent a possible source of danger. Mr. Rushmore's paper was well received and brought out a number of interesting questions.

The first paper read during the afternoon session was on "The Electric-railway Return Circuit," by E. G. Hindert of Elyria, Ohio. This paper was timely and interesting, and a number of waterworks representatives were present to participate in the discussion in relation to the electric corrosion of water mains. Mr. Hindert said that the great loss in return circuits is seldom realized, and for this reason action is often deferred to a more convenient time in order to keep down the expense account. These track losses are due to inadequate and improper bonding and the use of heavier cars. Mr. Hindert described the different methods of bonding and showed that much of the trouble is due to the employment of inexperienced men and a disposition to exercise economy. The life of the rails is limited to the life of the track joints so that the condition of track joints, electrically and mechanically, is very important. He stated that often the rails wore out more rapidly on the bottom than on the tread, due to the electrolytic action of the return current going through the earth to the power house. He cited examples of rails that had been in service a short time, with the base almost entirely eaten away while the tread was in good condition. Mr. Hindert described how losses in the transmission system could be located and gave tables and information of an interesting character. A good discussion followed.

Dr. Millener's paper on wireless control of cars is referred to elsewhere in this issue.

The next meeting of the association will be held in Lima, Ohio, November 19th.

ILLUMINATING ENGINEERS' CONVENTION

As previously announced, the annual convention of the Illuminating Engineering Society will be held in Philadelphia on October 5th and 6th. The program of papers published in the Western Electrician of August 1st will be carried out in the main. For the papers of H. M. Davies, W. T. Sterling and Dr. E. P. Hyde there will be substituted the following: "The Integrating Sphere in Industrial Photometry," by Dr. C. H. Sharp and P. S. Millar; "Calculating and Comparing Lights from Various Sources," by Carl Hering; "Street Lighting with Gas in Europe," by E. N. Wrightington, and "The Report of the Committee on Nomenclature and Standards," by Dr. A. C. Humphreys.

The El Reno Electric Interurban Railroad promises that cars will be running between El Reno and Oklahoma City by January 1st.

ALTERNATING CURRENTS AND THEIR APPLICATIONS

By Edson R. Wolcott

CHAPTER I.—GENERAL PRINCIPLES

Part I.

Introduction

The subject of alternating currents has found very extended application in recent years because of some important advantages possessed by currents which are constantly changing direction. Chief among these are the economical transmission and ready application of electrical energy when in this form. Transmission plays a very important part in electrical engineering, and any means of materially increasing its efficiency becomes of very great importance.

In general the same laws apply to both alternating and direct currents. There are certain principles, however, which in the case of direct current are practically negligible, and yet in the case of alternating currents are of the utmost importance.

The laws regarding the phenomena of alternating currents are very concisely expressed by mathematical formulæ, but it is often advantageous to consider them from other points of view, particularly from the viewpoint of mechanics. To him whose training in mathematics has not been thorough, such analogies are of special service provided they are not carried too far. For example, the electric current resembles a stream of water in some ways; the head of water is similar to the electromotive force of the electric current and the inertia of the flowing water is comparable to the self-induction of the electric current; but there is

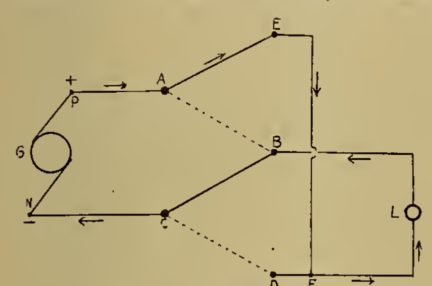


FIG. 1. CURRENT-REVERSING SWITCH

nothing in the fluctuating flow of water comparable to the induction of one alternating current by another. The electric current resembles this thing in some ways, that in another, but is exactly like nothing else.

Generation of Alternating Currents

Direct-current Reversal

An alternating current, as the name implies, is simply a current of electricity flowing periodically first in one direction and then in the other. It is the form in which the current is generated when a conducting coil is rotated in a magnetic field. It can also be produced from a direct current by means of a reversing switch. The latter is not a practical method, but is valuable as a means of illustrating the form of a fluctuating current.

Thus, as in Fig. 1, let *G* represent a direct-current generator and *A B C D E* a reversing switch connecting the generator to the electric light *L*. If *P* represents the positive terminal of the generator and *N* the negative terminal, the current will flow through the lamp in the direction shown by the arrows if the switch is in the position indicated by the heavy lines. When it is thrown to the position indicated by the dotted lines the current through the lamp *L* will be in the opposite direction. If the switch be thrown regularly from one position to the other an alternating current will flow through the lamp.

Graphical Illustration

It is advantageous in many ways to illustrate graphically the change in value of an electric current with time, just as variations in temperature, pressure and other quantities are often recorded. Fig. 2 illustrates the change in value of the current at successive intervals of time as it flows through the lamp after being periodically reversed by the switch shown in Fig. 1. The current strength in amperes is plotted along the line *Y O Y'*, each space representing five amperes. The time in seconds is plotted along the line *O X*, each space representing one second.

Suppose that at one second after a certain hour, as represented by the point *C* in Fig. 2, the switch shown in Fig. 1 is thrown to the position *B E*. Let a current of one ampere then flow through the lamp for three seconds. It will be represented in Fig. 2 by the line *A B*, if the current be considered to rise instantaneously from zero value at *C* to a value of one ampere as represented at *A*.

Then let the switch be thrown instantaneously to *B D*, Fig. 1, and the current will drop to zero as represented at *D* and immediately rise to a

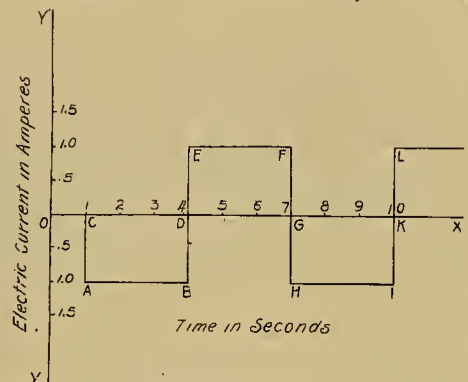


FIG. 2. CURRENT CURVE PRODUCED BY REVERSING SWITCH

value of one ampere in the opposite direction, as represented at *E*. If the switch remain in this position for three seconds the current will be represented by the line *E F*. By continuing this procedure an alternating current of the type shown by the curve *C B F L* will be produced. This type differs from that in practical use in that the latter changes direction more frequently, and the changes are gradual, as shown in Fig. 3.

The time indicated by the line cycle *C G* of Fig. 2 represents the time required to complete the cycle of operations necessary to again bring the current under the same condition as at the beginning; that is, at the point *G* the current is again about to start in the same direction as at the point *C*. This, the times *C G*, *E L*, *B I*, *D K*, etc., each represent the period of one cycle.

Frequency

The frequency of an alternating current is the number of cycles per second. In the case of the

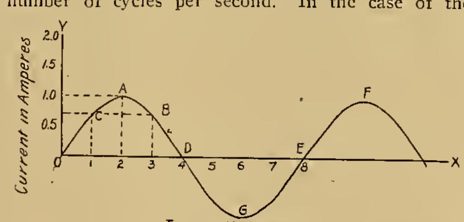


FIG. 3. TYPICAL ALTERNATING-CURRENT WAVE

current illustrated in Fig. 2 the frequency is one-sixth cycle per second; that is, the reciprocal of the period of one cycle.

Sine Curve

The typical form of an alternating current is represented in Fig. 3, where the current increases gradually to a maximum in one direction, decreases gradually to zero, increases gradually to a maximum in the opposite, and so on. This kind of a curve is known as a sine curve, because of certain mathematical properties. Not all alternators generate a current of exactly this form, but they are all reducible to it.

The period of the current represented in Fig 3 is 8-480 or 1-60 of a second. Its frequency is, therefore, 60 cycles per second. As shown at *A* its maximum value is one ampere, which is attained 2-480 of a second after passing through zero value, its value being about 0.7 ampere 1-480 of a second from the start at zero, as shown at *C*. Again, 3-480 of a second from the beginning it has a value of 0.7 ampere, as shown at *B*. When the time is 4-480 of a second the current again has a zero value as shown at *D*. At 6-480 of a

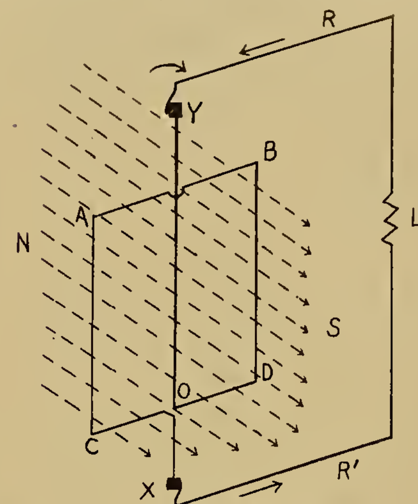


FIG. 4. A SIMPLE FORM OF ALTERNATING-CURRENT GENERATOR

second, its value is one ampere in the opposite direction, and so on.

Generation of Alternating Currents

The above may be considered as the form of current generated on rotating a conducting rectangle in a magnetic field, as illustrated in Fig. 4. Here *A B C D* represents the rectangle which is to be considered as at right angles to the lines of form *N S*. The rectangle is rotated about the axis *X Y* in a clockwise direction, as viewed from the top; that is, with the side *B D* moving toward the spectator, and the side *A C* moving away from the reader as indicated by the circular arrow near *Y*.

At *Y* and *X* are shown collecting rings which supply the external resistance *L* with current by means of the conductors *R* and *R'*. Let the rectangle make 60 revolutions per second and the magnetic field strength be such as to generate a current of one ampere maximum value. The curve in Fig. 3 can then be used to represent the fluctuations of the current as the coil is turned through the magnetic field.

[*To be continued.*]

CYANAMIDE INDUSTRY AT NIAGARA FALLS

One of the many industries in the growing city of Niagara Falls, Ont., is the manufacture of cyanamide. Hundreds of men are now employed in erecting the permanent buildings. The first structure erected measures 150 by 150 feet, being 66 feet in the highest part. Three other buildings have been started, each of which will be 100 feet square.

Coke and lime are used in the manufacture of cyanamide by means of an electric furnace, the resulting compound being in turn pulverized and combined in a second electric furnace with nitrogen from the air secured by a special process. The material thus obtained contains 20 per cent. in weight of nitrogen, the balance being the coke and lime compound which serves to bind the nitrogen. This compound is calcium cyanamide, and when sown in the soil it decomposes and dissolves in contact with the soil moisture, is then absorbed through the roots of the plants and becomes a valuable constituent. Three years of actual use upon farms in Europe has proved the value of this substance in connection with the wheat, corn, oats, barley, rye, rice, tobacco, and other crops. Some crops have been doubled by its use.

The present plant, which is of 5,000 tons capacity, must be regarded as an introduction of this new industry. Mr. W. H. H. Webster, the United States consul at Niagara Falls, Ont., reports that plans are already in preparation for the establishment of a plant of 20,000 tons capacity.

THE WRIGHT AEROPLANE AND WIRELESS COMMUNICATION

By Frank L. Perry

Part IV.

Starting the Aeroplane

Only a short explanation is necessary to give the reader a clear idea of how the machine mounts into the air. Briefly, the aeroplane is practically shot obliquely into the air by the action of a heavy falling weight. Reference to Fig. 16 will show diagrammatically a single-rail track laid on

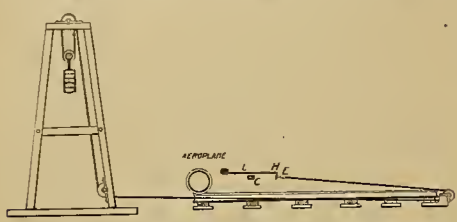


FIG. 16. STARTING MECHANISM OF THE AEROPLANE

the grass on blocks. At one end of this runway is a four-post tower, looking very much like an oil derrick. Suspended on a system of pulleys connected with a five-eighths-inch hemp rope is a weight of several hundred pounds. This weight is pulled up into the air for, say, 10 feet, and the rope from it runs out alongside this single track to its end, where it passes over a six-inch iron grooved pulley and back to the bottom of the aeroplane framework. This rope is attached to the aeroplane by a sort of trigger *L*. This trigger is so constructed that when the aeroplane, pulled by the jerk of the falling weight, reaches the end of the runway, the trigger releases the rope from the aeroplane and leaves it free to mount into the air. The weight by this time has about reached the ground.

As shown in Fig. 16, the eye *E* of the rope is attached to the horizontal swinging lever *L* of the aeroplane by the hook *H*. As the aeroplane shoots over the monorail, the eye *E* drops from the hook, and the lever *L* falls into a safe position on a crossbar *C*, which is also a part of the aeroplane.

In starting the aeroplane, the aviator mounts his seat and gives the word to start. The weight is allowed suddenly to drop. The aeroplane resting on a sort of single-wheel truck and balanced by a man at each side, shoots forward until at the end of the track it has attained, roughly speaking, about a 20-mile speed. Now by a slight manipulation of the lever to his left the aviator elevates the nose, so to speak, of the aeroplane (viz., front horizontal rudder) and the machine instantly leaves the track, and mounts in a most graceful manner into the air, thereafter forced ahead by propellers.

According to Mr. Wright, one of the chief sensations at starting is a realization of the great noise of the motor, and the seeming rush of the ground backward beneath him. Once in the air, the higher the aeroplane mounts the slower it seems to go. When at quite a distance from the ground, although really going at the same high speed, the motion seems to the aviator to be "slowing up," except in cases where the machine is running directly into the wind. In this instance the speed appears to be greater than it is. When the aeroplane is running with the wind or in calm atmosphere, Mr. Wright states, the sensation is one of great peace and satisfaction, with little or no appreciation of great speed.

How It Flies

In offering the following explanation as to how the Wright aeroplane flies, it is desired that the reader understand that the information relative to the operation of the machine was gleaned largely through a number of hurried and disjointed interviews with Mr. Orville Wright, and while the writer believes the explanation to be substantially correct, it is his wish not to do Mr. Wright the injustice of stamping it as absolutely authentic in every detail. A new art has only just been born; the "aviator" now vies with the chauffeur; and an electrical man's explanation of how to fly might show some slight error. But be it said that this article was prepared with great care and largely from reference sources, one patent in particular, suggested by Mr. Orville Wright himself, who, however, made very natural reservations in conversation, for there were points relative to construction and principles of operation that could not be given to the public at this time.

This explanation will give, it is thought, an idea of how flight is accomplished with this machine. But would-be aviators and aeroplane builders are warned, that, as one may build or may own a piano, while very few can be expected to be Paderewskis, so in this case the art of manipulation must be mastered, and in this instance, too, in the case of the amateur it may be at the risk of his life or great bodily injury. Nevertheless, Mr. Orville Wright may be quoted as making the statement that he feels confident that he can teach men of such high-class intelligence as the officers of the Signal Corps, to become, even in a few weeks, quite expert aviators.

"How do you do it?"

It is safe to say that Mr. Wright has been asked this question a thousand times, and many doubtless were not capable of conceiving the full intricacies of the Wright aeroplane and of the art of flying. Hence the difficulty of quickly making clear its subtleties.

In the study of the Wright aeroplane it must first be borne in mind that the weight is sustained by the reactions resulting, when one or more aeroplanes are moved through the air edgewise at a small angle of incidence, either by the application of mechanical power or by the utilization of the force of gravity. In the aeroplane are provided means for maintaining or restoring the equilibrium or lateral balance of the apparatus, means for guiding the machine both vertically and horizontally, and at the same time the structure must combine lightness, strength and convenience of construction.

In flying machines of this character the apparatus is supported in the air by reason of the contact between the air and the under surface of one or more aeroplanes, the contact surface being presented at a small angle of incidence to the air. The relative movements of the air and aeroplane may be derived from the motion of the air in the form of wind blowing in the direction opposite to that in which the apparatus is traveling; or by a combined downward and forward movement of the machine, as in starting from an elevated position; or by combination of these two things; and in either case the operation is that of a soaring machine, while power applied to the machine to propel it positively forward will cause the air to support the machine in a similar manner. In either case, owing to the varying conditions to be met, there are numerous disturbing forces which tend to shift the machine from the position which it should occupy to obtain the desired results.

The chief object of the design of this aeroplane is a means for remedying this difficulty.

The machine shown is comprised of two parallel superposed aeroplanes, although it may be embodied in a structure having a single aeroplane. Each aeroplane is of considerably greater width from side to side than from front to rear.

Before proceeding to a description of the fundamental theory of operation of the structure the preferred mode of constructing the aeroplanes and those portions of the structure which serve to connect the two aeroplanes should be mentioned.

Each aeroplane is formed by stretching cloth, such as unbleached muslin, over a frame composed of two parallel transverse main spars, extending from side to side of the machine, and connected by bows, extending from front to rear of the machine. The front and rear spars of each aeroplane are connected by a series of parallel ribs, and these extend somewhat beyond the rear spar, as shown roughly in Fig. 17. These spars, bows and ribs

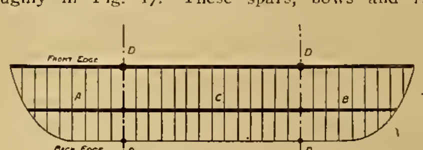


FIG. 17. SKETCH SHOWING CONSTRUCTION OF AEROPLANE

are constructed of wood having the necessary strength, combined with lightness and flexibility. Upon this framework the cloth which forms the supporting surface of the aeroplane is secured, the frame being enclosed in the cloth. The cloth for each aeroplane previously to its attachment to its frame is cut on the bias and made up into a single piece approximately the size and shape of the aeroplane, having the threads of the fabric arranged diagonally to the transverse spars and longitudinal ribs. Thus the diagonal threads of the cloth form truss systems with the spars and ribs, the threads constituting the diagonal members. A hem is formed at the rear edge of the cloth to receive a wire, which is connected to the ends of the rear spar and supported by the rearwardly extending ends of the longitudinal ribs, thus forming a rearwardly extending flap or portion of the aeroplane.

This construction of the aeroplanes gives a surface which has great strength to withstand lateral and longitudinal strains, at the same time it is capable of being warped or twisted in the manner hereafter to be described.

The two aeroplanes are connected together by upright standards. These standards are substantially rigid, are constructed of wood and are of equal length, equally spaced along the front and rear edges of the aeroplane, to which they are connected at their top and bottom ends by hinged joints, or universal joints, constructed about as

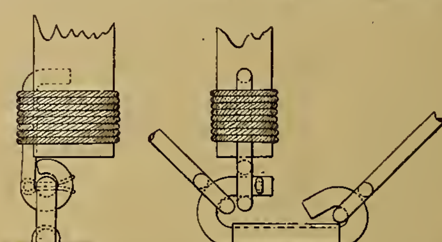


FIG. 18. MANNER OF CONNECTING AEROPLANES

shown in Fig. 18. Diagonal braces or stay wires extend from each end of each standard to the opposite ends of the adjacent standards.

It will be seen that this construction forms a truss system which gives the whole machine transverse rigidity and strength, while at the same time the jointed connections of the parts permit the aeroplanes to be bent or twisted in the manner which is necessary for proper flight.

Now, without going into a detailed description of a delicate yet simple method of construction, whereby the planes at their outside ends may be warped or twisted (a matter which the designers do not wish to explain in detail), it may be stated that by this means, it is possible by a single movement of one lever at the right of the aviator's seat, to move up or down the back edge or corner of the lateral edges of the aeroplane. They may be warped, at will, on one side of the machine either above or below the normal planes of the aeroplanes, a reverse movement of the similar corners on the other side of the machine occurring simultaneously.

During this operation each aeroplane is practically twisted or distorted around a line extending centrally across the same from about the middle of one lateral margin to about the middle of the other lateral margin, the twist due to the moving of the lateral margins to different angles extending inward toward the central portion, from side to side, so that each aeroplane surface is given almost a helicoidal warp or twist. This construction and mode of operation gives a gradually increasing angle to the body of each aeroplane from the central longitudinal line outward to the margin, thus giving a continuous surface on each side of the machine, which has a gradually increasing or decreasing angle of incidence from the center portion of the machine. Any construction whereby the angular relations of the lateral margins or portions of the aeroplanes may be varied in opposite directions with respect to the normal planes of the aeroplanes, comes within the scope of the designer's idea.

It should be understood also that while the lateral margins of the aeroplanes move to different angular positions with respect to or above and below the normal planes of the aeroplanes, it does not necessarily follow that these movements bring the opposite lateral edges to different angles, respectively, above and below a horizontal plane, since the normal planes of the bodies of the aeroplanes are inclined to the horizontal when the machine is in flight, the inclination being downward from front to rear, and while the forward corners on one side of the machine may be depressed below the normal planes of the bodies of the aeroplanes, the depression is not necessarily sufficient to carry them below the horizontal planes passing through the rear corners on that side. Moreover, although it is preferred so to construct the apparatus that the movements of the lateral margins on the opposite sides of the machine are equal in extent and opposite in direction, yet it may be desirable under certain circumstances to move the lateral margins on one side of the machine, in the manner just described, without moving the lateral margins on the other side of the machine to an equal extent in the opposite direction.

Turning now to the purpose of this provision for moving the lateral margins of the aeroplanes, it should be premised that, owing to various conditions of wind pressure and other causes, the body of the machine is apt to become unbalanced laterally, one side tending to sink and the other side tending to rise, the machine turning around its central longitudinal axis.

The provision just described enables the operator to meet this difficulty and preserve the lateral balance of the machine.

Assume that for some cause that side of the machine which lies to the left of the observer respectively, as indicated in the photographs previously given.

It will be observed in this connection as a most important point that the construction of the aeroplane is such that this rudder will always be so turned as to present its resisting surface on that side of the machine on which the lateral margins of the aeroplanes present the least angle of resistance.

The reason of this construction is that when the lateral margins of the aeroplanes are turned in the manner just described, so as to present different angles of incidence to the atmosphere, that side presenting the largest angle of incidence, although being lifted or moved upward, at the same time meets with an increased resistance to its forward motion, and is therefore retarded in its forward motion; while at the same time the other side of the machine, presenting a smaller angle of incidence, meets with less resistance to its forward motion, and tends to move forward more rapidly than the retarded side.

This gives the machine a tendency to turn around its vertical axis, and this tendency, if not properly met, will not only change the direction of the

Reading from the left: Captain Baldwin, Orville Wright, Lieut. R. B. Creecy, Lieut. B. D. Foulois, Lieut. T. E. Selfridge, Secretary Post of the Aero Club of America, Lincoln Beachey

FIG. 19. A GROUP OF PROMINENT AERONAUTS AT FORT MYER

has shown a tendency to drop downward, a movement of the lateral margins of the aeroplanes in the manner already described is now made, so that the margins on the left will be inclined downward and rearward and the opposite lateral margins will be inclined upward and rearward with respect to the normal planes of the bodies of the aeroplanes.

With the parts of the machine in this position, it will be seen that the lateral margins on the left present a larger angle of incidence to the resisting air, while the lateral margins on the other side of the machine present a smaller angle of incidence.

Owing to this fact, the side of the machine presenting the larger angle of incidence will tend to lift or move upward, and this upward movement will restore the lateral balance of the machine.

When the other side of the machine tends to drop, a movement in the reverse direction will restore the machine to its normal lateral equilibrium. Of course a like effect will be produced in the same way in the case of a machine employing only a single aeroplane.

In connection with the body of the machine as thus operated, there is employed the vertical rudder or tail, so supported as to turn around a vertical axis. This rudder is supported at the rear ends of arms, pivoted at their forward ends to the rear margins of the upper and lower aeroplanes, front of the machine, but will ultimately permit one side to drop into a position vertically below the other side with the aeroplanes in vertical position, thus causing the machine to fall.

The movement of this rudder prevents this action, since it exerts a retarding influence on that side of the machine which tends to move forward too rapidly, and keeps the machine with its front properly presented to the direction of flight and with its body properly balanced around its central longitudinal axis.

The all-essential feature, then, of this rudder, is that it shall be vertical and shall be so moved as to present its resisting surface on that side of the machine which offers the least resistance to the atmosphere, so as to counteract the tendency of the machine to turn around a vertical axis when the two sides offer different resistances to the air.

By means of the lever to the operator's left regulating the pressure on the upper and lower sides of the rudder through changes of its angle, a turning movement of the machine around its transverse axis may be effected, and the course, too may thus be directed upward or downward at the will of the operator, and the longitudinal balance maintained.

Contrary to the usual custom, the horizontal rudder is placed in front of the aeroplane at a negative angle and no horizontal tail at all is employed. By this arrangement there is obtained a forward surface which is almost entirely free from pressure under ordinary conditions of flight, but which, even if not moved at all from its original position, becomes an efficient lifting surface, whenever the speed of the machine is accidentally reduced very much below the normal.

This design largely counteracts that backward travel of the center of pressure on the aeroplanes which has frequently been productive of serious injuries, by causing the machine to turn downward and forward and strike the ground head on.

Forward horizontal rudders of different construction have been used, the Wrights admit, in combination with a supporting surface and a rear horizontal rudder. But they assert that this combination as used by others than themselves was not intended to effect and does not effect the object which they obtain by the arrangement above described.

When first building aeroplanes the Wrights worked with a construction in which each aeroplane was given a twist along its entire length in order to set its opposite lateral margins at different angles. But as it was only necessary to move the lateral marginal portions, later on the present form of frame for the aeroplanes was adopted. This is, roughly speaking, made in three parts, as indicated in Fig. 17. The plane is really made in three sections, two outside wings *A* and *B*, a central portion at *C*, and all hinged, as shown at *D D* and *D D*.

Remembering that the two forward parallel horizontal planes have nothing whatever to do with the steering of the machine and are only for the maintenance of the aeroplane's fore-and-aft equilibrium, the principle of Mr. Wright's wonderful method of mechanical flight, it may be ventured, becomes clear to the reader.

From the above, and now referring to the photograph showing the engine with the aviator's seat and the three levers (Fig. 12, page 227), it will not be hard to understand the work of the aviator. The mechanical details of the warping of the planes by the movement of the levers are withheld. But it may be stated that of the twin levers at the aviator's right hand, the one next to him works the back rudder, and by it this rudder is swung back and forth to produce movement to the right or left. The outside lever of this twin set of levers operates by its forward and backward movement to swing or warp up and down, so to speak, the ends of the side plane, each in an opposite direction to the other's movement. When in its middle position, therefore, this lever acts to keep the aeroplane's ends in an exactly symmetrical angle one to the other, and at the minimum angle with the horizontal. The two planes are warped always in unison, but, as a layman would put it, when one side or wing of the machine "goes up" the other two back lateral edges "go down."

Conclusion

The photograph of Fig. 19, which shows Mr. Orville Wright as the second man from the left, also contains portraits of a number of the leading aeronauts of this country. This picture was taken at the balloon tent in which the aeroplane was housed, at Fort Myer.

The first man to the left in the photograph and standing at Mr. Wright's right hand is Captain Baldwin, so well known through his successful dirigible-balloon flights at Fort Myer. At Mr. Wright's left stands Lieut. R. B. Creecy, first-lieutenant, Marine Corps, who has made several ascensions in the dirigible balloon.

Next in line is Lieut. B. D. Foulois, also of the Signal Corps. Lieutenant Foulois is not only a daring aeronaut but a man who has risen in the Signal Corps through his own energy and ability. During the Baldwin tests he had charge of the mechanical and electrical features; his station was at the engine during the flights. Lieutenant Foulois has also done a great deal of wireless-telegraph work at Fort Leavenworth.

Next in line is Lieut. Thomas E. Selfridge, U. S. A. This gentleman has the distinction of having himself flown and operated, as an aviator, the "June Bug" at Hammondsburg, N. Y. [Since this was written the sad news of Lieutenant Selfridge's death was received.—Ed. W. E.] Secretary Post of the Aeronautic Club of America appears next in the picture, with Lincoln Beechy, the well-known aeronaut, at his left.

[*The end.*]

FALL TRADE PROSPECTS

Unusual interest attaches to the expressions of opinion relating to the fall trade outlook in the electrical industries which are given herewith. These views represent a wide area, geographically, and they come at a time when it is extremely interesting to know what the men in the business think of the prospects for the next three months. The recent financial depression and the presidential election combine to make this yearly inquiry of the Western Electrician of exceptional significance in 1908. In general, it will be observed that the tone of these expressions is hopeful, although subdued when compared with the elation of former years. The consensus of opinion seems to be that increased trade is in prospect, while in a gratifying number of instances the reports show a volume of business equal to or greater than that of the corresponding period in 1907. But the writers are quite competent to speak for themselves. Here is what they say:

J. W. Marsh, vice-president and general manager Standard Underground Cable Company, Pittsburg: While there is a gradual improvement in business, yet it is very slow in our line, and on account of the pending presidential election I do not look for much improvement until the election is over and the right man is elected.

H. T. Dyett, treasurer Wire and Telephone Company of America, Rome, N. Y.: We expect to see continuous improvement until business becomes normal early next year. Underlying conditions are good, we think, especially for the electrical trade. Copper is bound to be used in electrical installations in larger amounts in the next five years than ever before.

W. Edgar Reed, Pittsburg: The fall outlook for electrical industries seems to be exceedingly good, and the large amount of work which has been projected during the last year seems to be nearing the point where it will now be started and pushed rapidly to completion. This means increased activity in the electrical and also in closely allied industries in the near future.

Charles Blizard, third vice-president Electric Storage Battery Company, Philadelphia: Our business since the first of January has increased from month to month, and while the placing of large contracts is being postponed, we believe that during the last two months of the year business will be excellent. Our smaller business, in view of existing conditions, is very satisfactory.

S. C. Schenck, general sales manager Electric Renovator Manufacturing Company, Pittsburg, Pa.: We have increased our factory facilities twice during the last year and now find that even with these increases we are running so near to our capacity that it is probable that we will need an entirely new factory within the next few months. From this we believe that we have nothing to regret in the past and nothing to fear for the future.

H. M. Hirschberg, president Excello Arc Lamp Company, New York: As to the business situation and outlook for the coming season for electrical goods, it is most gratifying for us to state that from a personal visit made by the writer to the principal centers, we find a general resumption of activity, and we anticipate fully as large, if not a larger, turnover as last year. We would further add that up to the present time sales of Excello lamps this year exceed those for the same period of 1907.

George Cutter, president George Cutter Company, South Bend, Ind.: I am pleased to be able to express the opinion, most decidedly, that the prospects are very bright for good business in electrical supplies. The inquiries that we have received show to my mind conclusively that much business is in store for people in our loved profession this fall. We are doing more business than ever before and have built quite an addition to our factory this last month to take care of the demand. We believe the addition has cost about 20 or 25 per cent. less than it would next year.

Lars Jorgensen, F. G. Baum & Co., San Francisco: The ups and downs of an electric current follow the law of the sine wave. The ups and downs of business life have so far also followed a certain law, not exactly as well defined as the law of the sine wave, but after a down has always followed an up. The curve started downward about a year and a half ago, and last October reactance was suddenly switched in series. This started a third harmonic to roll from New York to San Francisco, causing great disturbance in all commercial circuits. Several banks had a much-needed housecleaning and many questionable business undertakings were not heard of afterward. Unfortunately, it also caused great inconvenience to the whole country. Then the curve on the business indicating meter rounded the lower turn and has been going upward ever since, slowly but steadily, only awaiting the passing of the election before it starts accelerating.

D. N. McBrier, vice-president Ball Engine Company, Erie, Pa.: We believe business is slowly but steadily improving, although we do not look for any great increase during the coming fall. As to our faith in the future, you may judge from the fact that we are building a considerable addition to our plant at this time.

George M. Gillette, chairman executive committee, Minneapolis Steel and Machinery Company, Minneapolis, Minn.: Business is improving. However, so many manufacturers have had such empty order files during the first six months of the year that it is going to take some time to get everybody filled up so that business will be back in normal condition, both as to volume and prices. The number of inquiries is certainly multiplying, and if the election turns out right, we believe things will continue to improve through the fall and that next year will be a very active and busy year.

F. S. Hunting, sales manager Fort Wayne Electric Works, Fort Wayne, Ind.: The business prospects this fall seem to be about in line with what might be expected from the business actually done already this year. We hardly look for any very marked increase in business until the presidential election is well out of the way, and even then it would seem as though conditions would improve quite gradually. Until the financial condition improves, so there is a reasonably good market for the securities of new propositions, we cannot expect any very marked improvement in business.

E. B. Howitt, secretary Brunswick Refrigerating Company, New Brunswick, N. J.: While we are not directly in the electrical business, possibly 95 out of 100 of our refrigerating plants are operated by electric motors. Trade in general, especially through agricultural districts, is showing a decided improvement; the outlook for a good fall and winter business is excellent, but in those districts that are supported largely by manufacturing interests the prospect for trade is very disappointing; in fact, we are receiving very depressing reports from our agents. Judging by this the manufacturing interests have not as yet felt any revival of business.

Wilson S. Howell, manager Electrical Testing Laboratories, New York: Our orders for general testing of lamps, instruments, apparatus and supplies both at these laboratories and at the shops of the manufacturers for the past seven months of this year were in excess of the orders received during the same period last year. Judging from present indications our fall trade will exceed that of last year. Our conditions are different from those of an old-established business. We are building up a new enterprise and believe that had not financial troubles existed last year our business would have been greater this year than it was. As the importance of testing is appreciated our business increases.

H. W. Reade, vice-president National Pole Company, Escanaba, Mich.: We consider prospects for fall trade in our line very favorable. There has been but very little construction work done by telephone and telegraph companies during the last year, and now that money is plentiful, copper cheap and wages lower than for several years, we see no reason why there should not be a heavy demand for poles both for renewals and new construction. The prosperity of the farmers should also be reflected in our business, as all up-to-date farmers now find the telephone a necessity. Taking all these factors into consideration, we are led to believe that we will enjoy good business in our line the coming season.

Frank W. Darling, treasurer Clay Product Company, Chicago: While electric-service companies are now beginning to resume underground construction work to a small extent, the general postponement of construction plans since November, 1907, has made a very depressed fall market. The manufacturers, desiring to run their plants rather than close down and suffer disorganization of working crews, have manifested their faith in the future market by piling a large part of their year's manufacture on the yards. The few chances now appearing have tempted such manufacturers to turn a part of their accumulated stocks into cash at a considerable sacrifice. As a result the selling price of conduit has gone below reason and seems to have little effect on stimulating the buying. We have been rather fortunate in having to supply the conduit for the rehabilitation work of the Chicago street-car lines this summer, and as a result have not accumulated a large stock. But there is very little call for conduit in the North after October and our usual winter market in the South does not seem active this year. The South is not recovering from the depression as rapidly as the North. Finally, the fall market for underground construction materials will not add a great deal to a generally poor summer's business.

E. J. Burke, president Blake Signal and Manufacturing Company, Boston: While we do not expect to see any boom in business, we do feel confident that the slow but steady improvement that has been under way since last February will continue. There may be a purely sentimental dullness and "marking time" the last two weeks before election. But with all underlying conditions as sound as they are, the real wealth producers of the country in good circumstances and with money to spend, in our opinion there must necessarily be a steady increase in demand covering all lines. It is better that such return to normal and prosperous conditions should be slow and steady rather than booming with almost certain reaction later on.

Albert Scheible, president, Ajax Line Material Company, Chicago: In outdoor lighting devices the general delaying of work on electric-light plants, which normally would have begun last spring, is not the only reason for a promising outlook this fall. The advent of the long-sought trebly efficient incandescent lamp has given a new impetus to incandescent street lighting, and the demand for tungsten street hoods already implies that hundreds of far-sighted central stations will be displacing gas lights with tungsten lamps this fall. Besides, the rivalry between competing cities, and even between business sections in the same city, promises further increases in street and display lighting, by which both the lighting companies and the trade generally ought to profit.

V. R. Lansingh, general manager Holophane Company, New York: The management of this company feels that there will be this fall a very large resumption of the electrical business throughout the entire country. In some ways it is rather difficult to judge the situation by the business of our company, inasmuch as, despite the financial depression through which we have passed during this year, the business of this company has increased over 54 per cent. Nevertheless, the reports from our branch houses and our salesmen would indicate that this fall will see a very large increase in business along electrical lines over the present, and that probably by next spring the electrical industry will be largely on the footing where it was before the present financial panic.

F. L. Kohlhase, National Stamping and Electric Works, Chicago: We have every reason to believe that the fall trade will be normal. We are not looking for anything above the average, but as we are now running within 95 per cent. of what we were doing a year ago, and have increased from 68 per cent., which was what we were doing a few months ago, we have every reason to believe that within the next 30 days we will get up in normal conditions and can see no reason why the electrical trade should not be good this coming season. While it is true that the presidential election has always affected trade more or less, we do not believe it will affect it more this year than it has others; in fact, not as much, for the reason that owing to the depression there is no stock on hand, and everyone will order, in fact will be compelled to order, and therefore the trade will no doubt be at least normal this season.

E. F. Kirkpatrick, vice-president B. S. Barnard & Co., Chicago: The first thought that comes in answer just at this time is, What will be the result of the national election next month? Not because there is any very vital question or issue of national importance to be decided by the election; in fact, never in the history of the republic has the national election interested the whole people so little as the coming one. However, it is natural that the election of a new chief executive of the United States should affect the business interests of the country just as does the new president of a corporation affect all those interested therein one way or another. Hence, what "fall trade prospects" will be can better be predicted after the election. It is safe to say, nevertheless, that present indications point to a very natural change for the better in trade generally at a very early date; in fact, the improvement has already begun to show itself. Last January the management of every manufacturing plant throughout the country inaugurated a policy of economy and retrenchment; improvements and extensions very necessary to the development of their business was stopped; purchasing agents accustomed to buying thousands of dollars' worth of supplies monthly suddenly dropped their purchases to 50 per cent. and less. Within the last few weeks, however, a material increase of buying in all lines is showing. Large improvements, new extensions and even new projects, plans for which had been approved and money appropriated last fall, and then suddenly pigeon-holed are again "in sight" and some of them now in actual course of construction. The rehabilitation of Chicago street railways, really only begun, the electrification of at least one, if not two, of the great railroad terminals in Chicago, and the building next year of the great subway in this city are assured sources of busines which should encourage its electrical trade. That we have had a "panic," no one will dispute; but why we have had a panic, few, if any, can explain. That it is an unnatural one, an unnecessary one, all will agree, and that it will pass as suddenly as it came, let us all hope.

Arthur Frantzen, secretary and treasurer Zenco Electrical Supply Company, Chicago: The situation regarding the supply trade seems to be very uncertain, with a general tendency of laying in as little stock as possible on account of the uncertainties of the presidential election. Personally I believe that there will be an immediate revival of good times should the ——— ticket be successful. [In this blank Mr. Frantzen wrote the name of a political party which may be guessed, perhaps.—Ed. W. E.] In the building line there is considerable activity, due to the fact that prices were never so low for material as they are today. Many prospective builders are taking advantage of the low market prices. This, in a way, will assist very materially in creating a demand for supplies in the very near future. It seems to me the depression would have disappeared some time ago had it not been for the uncertainties that always precede national elections. There has been considerable activity in the purchase of supplies by various customers, due to the extremely low prices, but this has been confined chiefly to people who have had ready money for such investments.

C. N. Lauer, manager, Dodge & Day, Philadelphia: We had expected by this time a marked improvement in business, but are compelled to report that, in our line, which has to do principally with the building of new industrial plants and public-service properties, conditions have not radically changed. It could hardly be expected that large operations of this character would be undertaken until the political situation has been more clearly defined. Further, no large construction work is likely to be undertaken in the northern states until the spring, and on this account the engagement of engineers for such operations is not likely to become general until the fall. We are able to report considerable activity in connection with the professional part of our business, namely, the preparing of reports on the betterment of existing properties. We would like to emphasize the advantage that would accrue to manufacturers who build now on account of the low price of materials and the favorable labor market. Conditions as we see them point to a marked improvement after the first of the year, but we anticipate no radical change before that time.

William D. Ray, contract agent, Sanitary District, Chicago: We feel confident that business is improving steadily month by month, and we believe that within another 12 months we shall see the country again in a prosperous condition. Election results may have some effect, but the issues, not being as important as heretofore, the forecast points very plainly to restored confidence. The Sanitary District's electrical department has received many inquiries from new industries desirous of locating along the canal, as well as from old enterprises planning to expand by erecting new factories. We observe, from our day-to-day canvass, many new factories being built in Chicago. Inquiries for electric power service are more numerous now than at any time this year. With the central station, the month-to-month registry of current consumption by meters in industrial plants indicates the varying conditions of business, and is a good tell-tale of the pulse of the manufacturing world. We venture to say that a canvass of the large central stations of the country in this respect will bring the intelligence that more wheels are running; that factories which were shut down six months ago are in operation today, and others running half-time then are running full time now. Better times are ahead, and we believe the manufacturers of electrical supplies will be found very busy during 1909.

C. H. Roth, president Roth Bros. & Co., Chicago: During previous years our business in the power apparatus used by telephone companies was a good proportion of our total business, but the financial conditions have caused a great decrease in the installation of telephone exchanges with a consequent decrease in the sale of power apparatus such as we manufacture. Notwithstanding this fact, our business up to this time shows an increase over the corresponding period of last year. This is evidence either that the general business conditions regarding the electric motor trade have not been as bad as some other branches of business, or that we have been more fortunate than other manufacturers in our line of business. We have always been optimistic regarding the business situation and have not seen any real reasons for such a depression in business as has been experienced by most people, and we believe that once business revives the electric motor manufacturers will experience the improvement as quickly as any other line of business. We believe there will be constant improvement, and good conditions in business should be looked forward to by the early summer of 1909. It is well known that many firms have systematically bought less raw materials and carried less finished stock than they should. This cannot last indefinitely. Good inquiries are coming in, and with good crops we look for a continually increasing business from now on. We do not believe that the presidential election will materially affect business.

ELECTRICAL EXHIBITS AT THE SHOE AND LEATHER FAIR

The third annual National Shoe and Leather Market Fair, held at the Coliseum, Chicago, August 26th to September 2d, was the most successful fair of its kind ever held. An idea of its size may be had from the fact that the exhibit space of the huge Coliseum—the home of the Electrical Show—was completely filled with displays of shoes, leather, machinery used in the shoe and leather industry and supplies. The decorations this year were even more elaborate than before, and they were uniform throughout. The general arrangement, size and furnishing of the booths also were uniform, thus giving a very pleasing general effect as well as giving each exhibitor an even chance to display his products.

Western Electric Company

Champion Shoe Manufacturing Company

Bragg Automatic Shoe-nailing Machine

ELECTRICAL EXHIBITS AT SHOE AND LEATHER FAIR

Shoes were much in evidence, of course, every kind, from ladies' fine shoes to men's high-top hunting boots, being shown. To the average individual, however, this part of the display was not as interesting as the shoes in different stages of manufacture. Shoemaking and repairing machinery was shown in the Annex, and it was here that the crowds lingered, watching some labor-saving machine do the work formerly done by hand. All these machines were driven by electric motors, both individual and group drive being used.

Although the shoe and leather industry is a comparatively new field for electrical apparatus, great interest was shown by both exhibitors and visitors in the exhibit of the Western Electric Company, which was the only electrical manufacturing concern exhibiting at the fair. Here both direct and alternating-current motors, arc lamps of various designs, exhaust and desk fans, and intercommunicating telephone sets were displayed. In addition to the motors shown in this exhibit, Western Electric motors were seen in operation driving the shoemaking machines of other exhibitors. The arc lamps, too, attracted much attention and a good many inquiries as to their adaptability to store and factory lighting and their superiority over the gas arc and other forms of illuminants. This was particularly true of the Hawthorn short arc lamp, which, on account of its compact design—it being only 20 inches over all—met with general favor from those who up to this time had been unable to use arc lamps because their factories had low ceilings. The intercommunicating telephone sets for store and factory use also came in for their share of attention. Many people were impressed with the advantages of an electric fan when they walked into the draft made by a 16-inch desk fan placed on a table near the aisle. The effect was particularly pleasing, however, for during the fair the Coliseum was uncomfortably warm, and this booth was the one cool place in the building.

The exhibits of four shoe-machinery companies were operated by Western Electric motors.

One of the best examples of this class of exhibits was that of the Champion Shoe Machinery Company. This exhibit showed a shoe-repairing outfit and harness-sewing machine. The repairing outfit consisted of a shoe stitcher, an edge trimmer, an edge cutter and a dust collector, all mounted on a common base and driven by a small 110-volt motor. Friction clutches enable the operator to put in operation any part or the entire equipment at will. The entire equipment requires but one horsepower for its operation and runs at 500 revolutions per minute.

The Puritan Manufacturing Company also had an interesting exhibit of sewing machines. These were driven from a line shaft under the table on which the machines were mounted. A 1½-horsepower direct-current motor was belted to this shaft.

J. E. Bragg & Co. showed a new automatic nailing machine, driven by a small direct-current motor similar to the one used by the Champion company.

The interest shown by the exhibitors and visitors at the fair in the electric motors and supplies showed that the shoe and leather field is one offering great opportunities to the manufacturer of electrical equipment.

COPPER MARKET

Under date of September 21st Copper Gossip of the National Conduit and Cable Company says: General conditions in the copper market lately have been fairly favorable to better prices when compared with those obtained during the early summer. Producers are consequently realizing a substantial advance over the figures received a few months ago, and this seems in line with the trade improvement that has taken place. There have been sales of Lake in round lots at 14 cents, and it is also claimed that Electrolytic sold for a while equally as high. The large sales in August supplied the wants of a good number of buyers, and since then a quieter tone prevails. With the slacking up in demand there is an easier feeling, and the present tendency appears to be in buyers' favor. * * * Trade has been picking up gradually for some time, but it is not surprising, with a presidential contest to be settled in a few weeks, if there are evidences of a pre-election lull in business. This is not unusual, but when the country settles down to the task of applying its energies to the work of developing its resources and operating its vast industries according to the ratio of its normal ability there will be a season of great activity once more in all quarters. When the railroads generally begin to buy materials and equipment it will be the signal for idle or partially operated machinery to start up everywhere. These great systems have gone very slowly of late, but they are in a position where they will be absolutely compelled to replenish their wornout or nearly imperfect equipment. Enormous requirements will be needed to prevent fatal deterioration of property and vested interests, and these features cannot be overlooked.

ELECTRICAL EQUIPMENT AT GARY

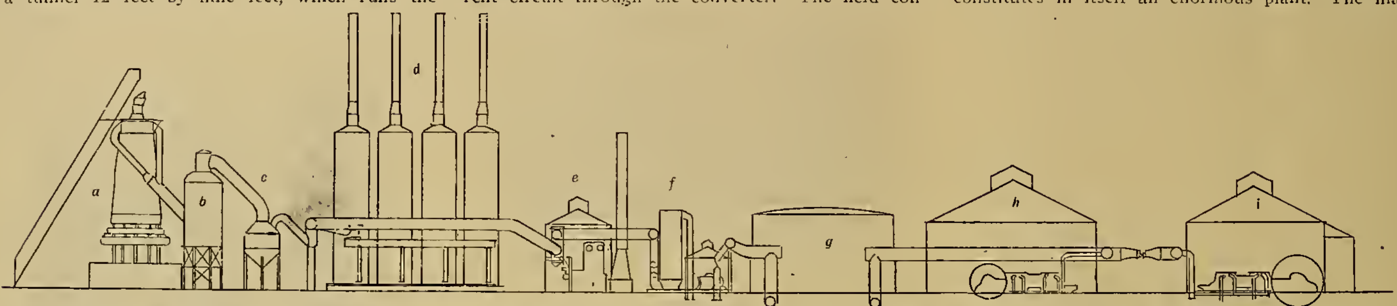
[*Continued from page 245.*]

weighing 200,000 pounds. The pistons and rods are water-cooled.

The igniters are electrically controlled and so arranged that the time of ignition may be regulated by a single hand wheel. Direct current at 80 volts is used in the ignition system. Duplicate independent igniters are provided at each end of the cylinder to insure prompt firing of low heat value gases and also to avoid the danger of shut-down due to short-circuit.

An air starting device consisting of a small poppet inlet air valve at each end of each cylinder is operated by the layshaft. Air is admitted to each cylinder, in turn, at what would be the working stroke. The high compression carried prevents the engine from stopping on the dead center, and being twin-tandem these engines will, of course, start from any position.

The exhaust from the gas engines is conveyed to a tunnel 12 feet by nine feet, which runs the length of the building and is provided at each end with a stack nine feet in diameter by 92 feet high.



a. BLAST FURNACE
Eight blast furnaces, producing 3,600 tons pig iron per 24 hours and 22,450,000 cubic feet gas an hour, equivalent to 250,000 B. H. P. (in gas engines)
b. DUST CATCHER
c. PRIMARY WASHER
d. HOT BLAST STOVES
Thirty per cent. used here, or 6,750,000 cubic feet an hour

e. BOILERS
For spare steam blower, pressure and other pumps, steam for gas producers, heating of buildings, etc. 7.5 per cent used here, or 1,700,000 cubic feet per hour
f. SECONDARY WASHER
2.5 per cent used here and in primary washers, or 600,000 cu. ft. per hour

g. GAS HOLDER
h. BLOWING ENGINE HOUSE
12.5 per cent used here, or 2,800,000 cubic feet per hour; 2.5 per cent used for blast-furnace auxiliaries. Total for furnace operation, 15 per cent., or 3,400,000 cubic feet per hour

i. ELECTRIC POWER STATION
45 per cent., or 10,000,000 cubic feet. available, equivalent to 110,000 B. H. P. (in gas engines), with gas at 90 B. T. U. per cubic feet and 10,000 B. T. U. per B. H. P.-hour gas consumption

DIAGRAM REPRESENTING PRODUCTION AND UTILIZATION OF BLAST-FURNACE GAS AT GARY, IND.

Electrical Generating Equipment

The alternating-current generators are of a type developed by the Allis-Chalmers Company for use with these engines. The laminated stator core is held in a heavy box yoke designed to allow full circulation of air around all parts. The revolving fields have poles of solid cast steel bolted to a heavy cast-iron spider, and can be readily removed to get at a field coil.

The direct-current generators are in general similar to the manufacturer's standard engine type machines.

In connection with the generators Cutler-Hammer crosshead-type remote-control field rheostats and field switches are furnished. The controlling apparatus is located in the basement near the generators, and is operated from the bench board located in the power house gallery. The rheostats are driven by vertical motors and are provided, also, for operating by hand in case of damage to the motor.

The power generated will be distributed throughout the works and used to operate the heavy induction-motor-driven rolls, the tilting and feed tables for the various passes, the hot saws, hot and cold pull-ups, hot rolls, transfer tables, straightening and drilling machines, cold saws, elevators, conveyors, pumps and a multitude of machines and mechanical devices auxiliary to the operation of such a large plant. Several of the motors built by the General Electric Company for driving the rolls are of 6,000-horsepower each, and from this size they range down to the machines used to operate switches in the power house.

The electrical system as a whole is subject to central control at a switchboard operated from a gallery 16 feet high. This switchboard, which was designed by the Western Electric Company, has the usual complement of instruments of standard types. To aid in securing maximum economy under heavy fluctuations of load by utilizing the full value of the generating power of the gas without regard to the amount of current required at any given time for the operation of the mills, a storage battery installation furnished by the Electric Storage Battery Company has been housed in a two-story building 87 feet long by 47 feet wide, located near the power station. The batteries will be kept charged as nearly as possible to their full capacity, in order to assist in meeting, for a considerable period of time, if need be, any demands for excessive power made upon the gas-engine-driven generators. The battery also aids in maintaining, at light loads, a constant pull on the generating equipment.

The control of the battery charge and discharge in respect to the 250-volt direct-current bus is effected by means of two motor-driven boosters, which may be operated singly or in parallel, their fields being controlled by a carbon regulator with its solenoid in series with the total output of the direct-current generators. The fluctuations of load on the alternating-current circuit are transmitted to the battery by means of a split-pole converter designed to hold constant the alternating-current voltage while permitting a sufficient range of direct-connecting voltage to cause the battery to charge from or discharge into the alternating-current circuit through the converter. The field control of this converter to effect this variation in direct-current voltage is accomplished by a special alternating-current-direct-current exciter, which corresponds to the energy component of the alternating-current output from the alternators.

The arches forming the roof of the power station have a clear span of 85 feet, providing headroom, at the dome, of 73 feet above floor level. The station is served by two 50-ton cranes. The interior walls for a distance of 10 feet are of white enamel brick, but above that point the surfacing is in red pressed brick. The exterior is of red building brick.

The Open-hearth Furnaces

Further economy is secured at the open-hearth furnaces, where provision has been made for retaining the heat of the molten iron, and at the same time insuring more uniform quality of the ingots, by conveying it in 40-ton ladles, on special trucks, directly from the blast furnaces to enormous mixers. There are two of these, shaped like converters, with a capacity of 300 tons each. The molten metal is then again poured into 40-ton ladles, carried by cranes to the furnaces and there emptied in by means of Wellman-Seaver-Morgan charging machines.

The plans of the plant provide for six batteries of basic open-hearth furnaces, 14 to the building, of which two batteries or 28 furnaces are at present constructed. Each of the open-hearth furnace buildings, lying upon monolithic concrete foundations, will be 1,200 feet long and built in three spans, giving a total width of 193 feet with a height of 104 feet above the floor line, thus allowing for excellent ventilation. The charging floors are of steel. The open-hearth buildings are placed at an angle of 35 degrees with the rest of the plant, to lessen the sharp curve of the railroad tracks which run through the buildings.

The open-hearth buildings are liberally equipped with electrically operated cranes, both traveling and fixed. There is one with a capacity of 125 tons in the casting department and another with a capacity of 125 tons on the charging side. The ladles handled in pouring off are of 80 tons capacity each.

With the four open-hearth buildings now completed or under construction, in operation, the Gary plant will have a capacity of over 12,000 tons of steel per day, or 2,500,000 tons per year. With all six buildings in use, the total capacity of the plant, as planned by the United States Steel Corporation, will be upward of 4,000,000 tons per year. The fact that the works at Gary are to be purely an open-hearth plant, emphasizes the trend of the industry away from the Bessemer to the open-hearth process, due to the greater reliability of the latter, at least in the making of steel rails.

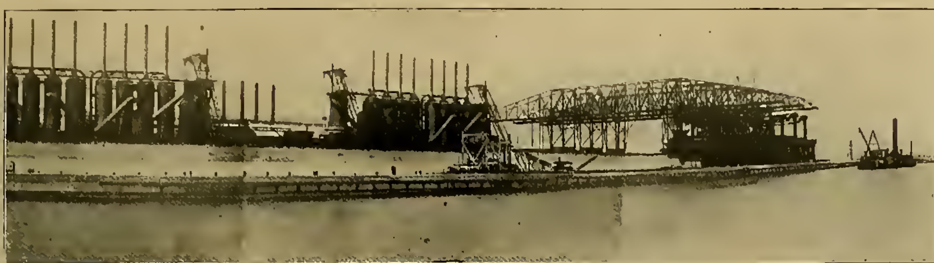
Manufacture of Steel Rails

The rail mill at Gary will be the largest in the world. With everything running, 4,000 tons of steel rails can be produced daily; and in normal operation the mill is expected to turn out 100,000 tons per month. Eighteen passes are required for the complete metamorphosis of the ingot from the bloom to finished rail ready for cooling. The group of rail-mill buildings, located about 300 yards from the lines of the open-hearth furnaces, constitutes in itself an enormous plant. The main structure is 1,800 feet long, and at right angles to it is another building of one-third the length, with a width in a single span of 85 feet. This contains 12 soaking pits or furnaces, each of which is supplied with gas from an independent Hughes mechanical gas producer. The arrangement here is such that ingots enter from the open-hearth-furnace buildings along the entire length of one side of the pit building, the other side being reserved for the electrically operated ingot buggies which transfer the heated ingots through the first stand of rolls. The ingots used are 20 inches by 24 inches and six feet long, weighing 8,500 pounds each. For the operation of the two ingot buggies used, the Cutler-Hammer Manufacturing Company of Milwaukee has developed an ingenious system of control. It is impossible for the operator stationed to see when an ingot buggy is opposite a particular pit. It was, moreover, deemed necessary to guard against the possibility of the operator becoming confused and bringing both ingot buggies to the mill at the same time, which would result in a collision. The controlling system provides against this contingency, at the same time enabling the operator to stop the ingot buggy at any of the pits. If the operator desires the buggy to go to pit No. 5, for instance, and there stop, he merely moves the controlling lever to the position corresponding to pit No. 5, and the buggy proceeds to that point, and is there automatically stopped. A suitable interlock between the two controlling levers is provided which renders it impossible for the operator to throw both levers to the mill position at the same time, thus insuring a clear track for each buggy.

The arrangement for receiving and handling coal for the gas producers consists of an elevated track upon which the coal is conveyed to overhead storage bins and thence distributed to the producers by means of a five-ton crane equipped with automatic scales.

The rail mill is equipped with 12 sets or stands of roll trains, all operated at varying speeds by General Electric alternating-current motors. Some of these motors, 6,000-horsepower, are of the largest sizes ever constructed for industrial service. They are housed in a separate bay or "lean-to," running parallel with the rolls. The rotors are 20 feet in diameter and have a speed of 83 revolutions per minute. All of the motors are connected directly to the roll trains by regular mill couplings. The aggregate driving capacity is 24,000 horsepower. Although the motors are provided with flywheels and operate in one direction, provision is made for reversing in case of necessity. All operations are under the instant control of the operator by means of a master controller.

The first group of rolls consists of four stands of continuous 40-inch mills, each two of which are driven by a 2,000-horsepower motor. Here, as



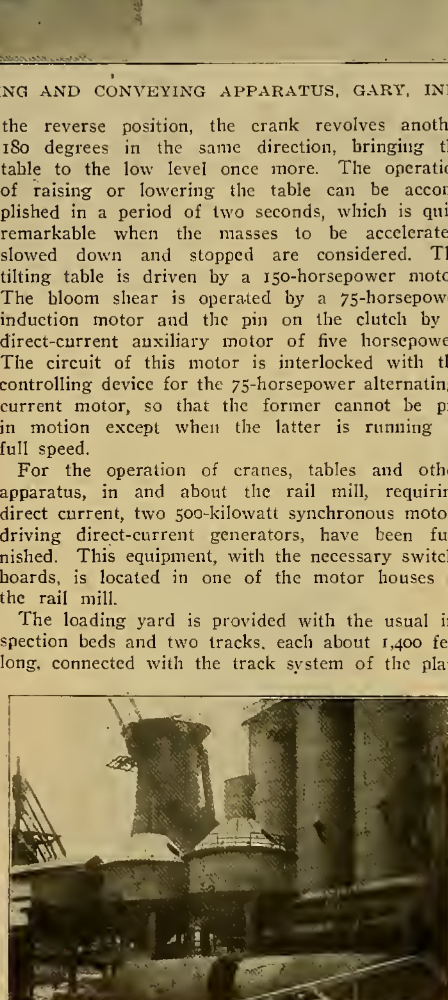
BLAST FURNACES AND ELECTRIC ORE-UNLOADING AND CONVEYING APPARATUS, GARY, IND.

elsewhere through the plant, sufficient distance is left between successive sets of rolls to enable a quarter turn of the ingot or bloom to be made, so that it is worked equally on all sides. The first two mills are at present equipped with 42-inch rolls, enabling 20-inch by 24-inch ingots to be used. After passing these four mills the ingot is sent to a 40-inch, three-high blooming mill equipped with lifting tables and arranged with a combined hydraulic and pneumatic balancing device. This mill, which is operated by a 6,000-horsepoer motor, gives the ingot five passes. After being bloomed the ingot is sheared in a 10 by 10-inch horizontal blooming shear, and the crop ends or butts are taken outside of the mill by a butt conveyor of unusual construction, which was designed and built by the engineers of the Indiana Steel Company. Each bloom then goes through a 28-inch roughing mill, which is three-high and equipped with tilting tables. This mill has actually three stands of rolls. The roughing stand, however, is the only one that is three-high, the other two stands being two-high. The mill is driven by a 6,000-horsepower motor and gives the bloom three passes. After leaving the roughing mill the bloom goes through a two-high, 28-inch forming mill driven by a 2,000-horsepower motor, receiving but one pass. Then it is sent to the finishing mill, which consists of five stands of 28-inch mills driven by two 6,000-horsepower motors. After the dummy pass, the bloom is transferred to the first edging, and turns back on an elevated table to the second edging, which is in line with the 28-inch roughing mill. It then travels by chain transfer to the lower tables and on the leading pass goes through a stand, which is also in line with the roughing mill and driven by the same motor and continues on to the third stand of the 28-inch finishing mill, this being the eighteenth and last pass. After the finishing pass the rail travels through to the saws, of which there are five provided, thus cutting four rails to length. These four rail lengths consist of half the ingot. As the capacity of this mill is 4,000 gross tons per 24 hours, it will be seen that there must be a four-rail length sawed about every half minute. The saws are 42-inch blades, arranged to be raised and lowered in unison by one controller by the hot-saw operator. After leaving the hot-saw run the rails pass over the usual cambering machine and are run on to the hot beds. The finishing building is 1,383 feet long, central with the hot beds, and provided with live rolls extending the entire length. The roller tables are equipped with stops and kick-offs to transfer the rails to the straightening presses, of which there are 16 of the usual type and motor-driven. From the straighteners the rails are transferred by skids to three-spindle vertical drill presses, also motor-driven. These complete the rails for use. From the drill presses the rails are transferred to a roller table, which extends the full length of the building, and from which the rails may be skidded to the loading beds immediately outside of the building.

In the rail mill a number of Cutler-Hammer automatic remote-control devices are installed, the most interesting of which are for the control of the elevated and tilting tables, the bloom shear and the transfer. The elevating table on the 48-inch blooming mill, weighing about 250,000 pounds, is supported on huge bell-cranks, which are connected to a rotating crank driven by a 250-horsepower motor operating at 150 revolutions per minute. By means of automatic controlling devices the throwing of a master lever starts the table from the low-level position and raises it to the highest level, where it is automatically stopped. In lighting the table from the low to the high level, the rotating crank moves through an arc of 180 degrees and, on throwing the master lever to the reverse position, the crank revolves another 180 degrees in the same direction, bringing the table to the low level once more. The operation of raising or lowering the table can be accomplished in a period of two seconds, which is quite remarkable when the masses to be accelerated, slowed down and stopped are considered. The tilting table is driven by a 150-horsepower motor. The bloom shear is operated by a 75-horsepower induction motor and the pin on the clutch by a direct-current auxiliary motor of five horsepower. The circuit of this motor is interlocked with the controlling device for the 75-horsepower alternating-current motor, so that the former cannot be put in motion except when the latter is running at full speed.

For the operation of cranes, tables and other apparatus, in and about the rail mill, requiring direct current, two 500-kilowatt synchronous motors driving direct-current generators, have been furnished. This equipment, with the necessary switchboards, is located in one of the motor houses at the rail mill.

The loading yard is provided with the usual inspection beds and two tracks, each about 1,400 feet long, connected with the track system of the plant



BLAST FURNACE GROUP, SHOWING PRIMARY WASHERS OF GAS-CLEANING SYSTEM

at both ends, thus avoiding any unnecessary shifting. The yard is also served by an 80-foot traveling crane for the entire length of the finishing department, and by means of this the rails are placed directly on flat cars.

In the Gary plant the railroad tracks along the finishing department of the rail mills will be at a slight grade, so that cars can be moved by gravity to the point where they are needed.

The billet mill consists of four continuous stands of 40-inch blooming mills, each two of which are driven by a 2,000-horsepower motor. After leaving these the ingot is turned end for end on a turntable and passes through a five-stand 32-inch continuous mill, the entire mechanism of which is driven by one 6,000-horsepower motor.

The Sacramento (Cal.) Terminal Company, with a capitalization of $250,000, has been organized by the promoters of the Northern Electric Company for the purpose of financing the latter's plans for the completion of its terminal in the town of Broderick, across the river from Sacramento.

A NEW 25-WATT TUNGSTEN LAMP

The accompanying illustration shows the latest addition to the line of tungsten incandescent lamps for standard lighting circuits (100 to 125 volts) that is being placed on the market by the General Electric Company. This is a 25-watt lamp. The lamp has the same diameter and base and approximately the same length as the familiar 16-candlepower carbon unit. The illustration shows it reduced to half size. This lamp will burn in any position and its size adapts it for use in any shade or fixture suitable for the 16-candlepower carbon lamp. It can be substituted therefore, lamp for lamp, in all present installations.

25-WATT TUNGSTEN LAMP, ONE-HALF ACTUAL SIZE

At 1¼ watts per candle the 25-watt lamp gives 20 candlepower, or 25 per cent. more light than the ordinary 16-candlepower lamp. The energy consumed is one-half that of the best 16-candlepower carbon lamp and considerably less than one-half the energy consumed by a 16-candlepower carbon lamp of similar life—800 hours.

The General Electric Company has been greatly increasing its lamp-manufacturing facilities and is now prepared to manufacture this lamp together with the 40, 60, 100 and 250-watt lamps at the rate of 35,000 lamps total output per day. Ample stocks of the larger lamps are carried at the main lamp sales office in Harrison, N. J., and at the various local sales offices throughout the country. The stock of the new 25-watt tungstens is at present somewhat limited, but the factory capacity is ample to maintain a reasonable delivery on all ordinary orders.

The list price of the new lamp is 85 cents plain and 90 cents frosted, subject to the regular discounts adopted September 1st. As the lamp will burn in any position and can be substituted in the regular course of renewals, it will undoubtedly find a large market among isolated plants, with the accompanying saving in the coal bill and the opportunity of doubling the number of units and nearly trebling the candlepower with the same equipment. It will probably also be gradually introduced on the circuits of central stations as rapidly as customers can be educated to appreciate its advantages.

TORPEDO CONTROL BY WIRELESS

Application of the principle of radio-telegraphy to the directing of the movements of torpedoes under water has been for some time the subject of experiments by Charles A. Logue of the Charlestown district, in Boston. Mr. Logue is a student at Boston University and is about 21 years old. Within a few days his model has been inspected by a torpedo expert from the Navy Department at Washington, and it is planned to construct a working model and test the invention in practical operation at the Newport naval station. The young inventor thus describes his device:

"It consists of a metal plate on the upper surface of the torpedo, so tuned as to receive currents only from one station where it is discharged. This current, acting on electric magnets in the torpedo, is carried to storage batteries situated in the air chamber, which operate two sets of special grip and pull wheels, controlling the rudder at the will of the operator."

The railroad ministry of the German Empire has given the first permission for electrification in connection with the centrals now existing in Magdeburg. The short sections, Gusten-Stassfurt and Gusten-Bernburg-Kothen, will be arranged for electrical operation. Later there will be a change of power on the Magdeburg-Bitterfeld-Leipzig line and afterward on the Halle-Leipzig line. Upon these electrical power will wholly supplant steam.

COMBINED INDICATING AND RECORDING INSTRUMENTS

An indicating switchboard instrument does no more than show to the operator the voltage current or wattage of the machine or circuit to which it is connected. It is usually the case that those principally responsible for the operation of a generating station are in actual attendance only a part of the time, and, in many cases, not at all. On this account, practice is now tending largely toward the use of graphic recording instruments, in addition to the usual equipment of switchboard indicating instruments, which make a permanent record of the operation of the plant, for the information of those responsible for its successful operation.

There has lately been produced a line of instruments known as the "Ideal" combined indicating and graphic recording instruments. They are manufactured by the Central Laboratory Supply Company, Lafayette, Ind. These instruments, as illustrated herewith, combine the indicating and recording feature, each constituting an edgewise switchboard indicating and a graphic curve-drawing instrument.

In Fig. 1 is shown a 0-750-ampere, direct-current recording ammeter. The movement is entirely enclosed in a dust-proof metal case, which also accommodates the clock train used to control the feed of the paper and the movement of the inking pen.

The instrument proper is a standard, high-grade switchboard movement, with a light tube substituted for the pointer. In Fig. 2 is illustrated the movement of the direct-current instruments. The tube is mounted on pivots and carried in a support mounted on the moving element of the instrument. The inner end of the tube dips into a stationary ink well, while the outer end terminates in an inking pen. The ink is drawn from the ink well and carried through the tube to the pen.

The pen is normally free from the paper. On the support which carries the tube is mounted a small soft iron armature, above which is a small electromagnet. Every half second the clock closes a circuit through this magnet, which attracts the small armature, bringing the pen on the end of the pointer in contact with the record sheet, making a record of its position. It will be seen, therefore, that the pen is in contact with the paper only a small part of the time, and is otherwise free to swing. On the tube near the pen is also mounted the indicator, which moves in front of the scale, forming an edgewise indicating instrument.

The record sheets are six inches in width, with a scale four and one-half inches wide. The records are in rolls three inches in diameter, constituting a supply for two weeks' continuous running. The method devised for feeding the paper has the advantage that it puts no drag on the clock mechanism. The paper feeds over a drum three inches in diameter, provided with projections which engage holes in the edge of the record sheet. This roll is driven by a small worm gear, which is actuated by a ratchet wheel, the pawl of which is the armature of a small electromagnet in circuit with the one which gives the pen its movement.

The current required by the two magnets is only one-fifteenth ampere, at a pressure of four volts, the energy required to feed the paper being less than one-fourth of a watt. The current for the magnets is usually supplied by connecting across one or two steps of a field rheostat of one of the machines in the plant, or it can be obtained from a pair of dry cells. No other controlling circuits are required.

One of the chief features of superiority claimed for these instruments is the fact that the pen is normally free from the paper, eliminating all friction, blotting and giving an instrument of the same sensibility as the best indicating instruments. The record is a series of small dots, it is clear and distinct, free from blots or blurs, no matter how rapid the current fluctuates. The ink well has a capacity sufficient for continuous operation for one month.

As shown in Fig. 3 the front of the case is hinged, and opens downward, so that the case can be opened and closed without removing the record sheet. The instruments are made either so as to feed the record through an opening in the bottom of the case, or with a roll to wind it up as it comes from the upper drum. For convenience in inserting new charts, the drum and record roll are mounted on a hinged door, which can be swung open, removing this part of the instrument from proximity to the pen and scale and making the drum easily accessible for inserting the new chart.

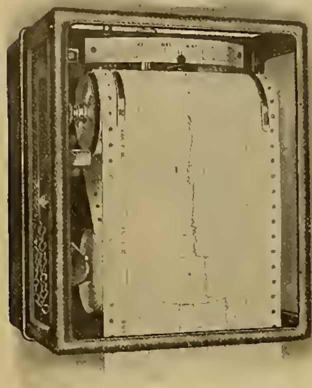


FIG. 1. A 750-AMPERE DIRECT-CURRENT RECORDING AMMETER

FIG. 2. MOVING SYSTEM OF DIRECT-CURRENT INSTRUMENTS

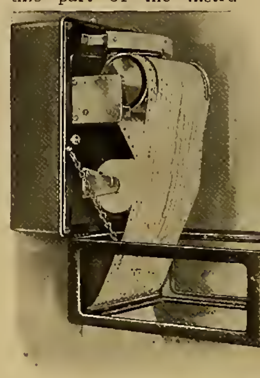


FIG. 3. RECORDING INSTRUMENT WITH CASE OPENED

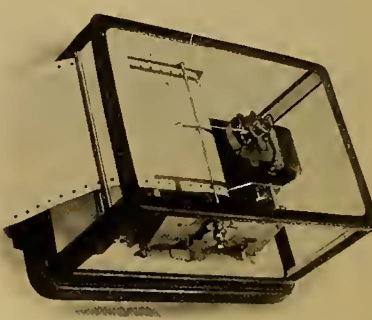


FIG. 4. PORTABLE COMBINED INDICATING AND RECORDING INSTRUMENT

The clock is a standard high-grade eight-day model, and can be placed within the instrument or as far from it as is desired or convenient. Where a number of instruments are installed on one switchboard, one clock can be used to control them all.

The instrument is made in the following types: Direct-current ammeters, voltmeters and wattmeters; alternating-current ammeters, voltmeters and wattmeters; power-factor meters; frequency meters; totalizing meters and pyrometers.

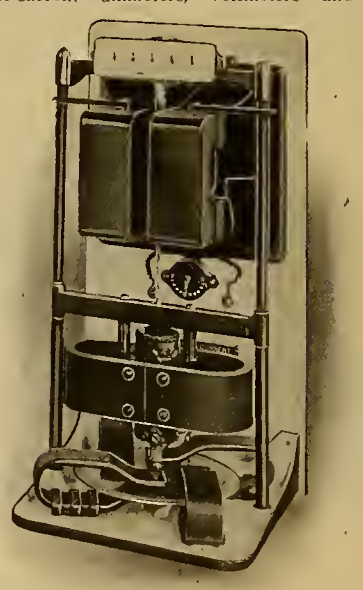


FIG. 5. INTEGRATING WATTMETER WITH TOTALIZING ATTACHMENT

All the switchboard instruments are made back connected. Direct-current ammeters are of the milli-voltmeter shunt type, so that they can be connected across any standard shunt and be made to read correctly, making it unnecesary to supply shunts if these are already installed. Instruments can be located a considerable distance from the shunts and operate satisfactorily. The direct-current voltmeters have self-contained resistances up to 750 volts and a sensibility of 50 ohms per volt. If desired they can be furnished with a sensibility as high as 500 ohms per volt.

Direct and alternating-current wattmeters are of the moving-coil type and can be made to operate satisfactorily at any frequency from 25 to 140 cycles. Alternating-current ammeters are made for a current of five amperes, and are used with standard series transformers. They can be put in circuit with standard switchboard ammeters, or transformers which are already installed.

These instruments can be used and operated successfully anywhere or under any conditions where ordinary indicating instruments can be operated, since they are simply high-grade indicating instruments with the curve-drawing features added. If at any time records are not required, it is only necessary to open the control circuit, and the instrument will continue to operate as an indicating type. They are also made in the portable type, as shown in Fig. 4. They can be adapted for recording the speed of trains, steamships and as temperature-recording instruments.

Everyone actively connected with an electric station appreciates the value of a knowledge of the load curve of the plant, but in the past the only method of obtaining such a load curve has been to add numerically the readings from indicating instruments, and plot these by hand in a curve.

As has already been pointed out the "Ideal" instrument can be made in the form of a recording milli-voltmeter, and this fact has made possible the "totalizing" meter, which successfully combines the outputs of all the generators in a station, drawing a true load curve. It will combine the outputs of alternating and direct-current generators, storage batteries, etc., regardless of the frequency, voltage, power factor or phases.

It is well known that the speed of the disk of an integrating wattmeter is directly proportional to the power passing through the meter. Mounted on the spindle of a switchboard recording wattmeter is a small magneto armature, the iron core of which is stationary and supported from the frame of the integrating wattmeter. The armature winding revolves about the stationary core between the poles of a permanent magnet. Obviously this magneto armature will develop an electromotive force proportional to the speed of the meter disk and therefore proportional to the watts passing through the integrating meter. A recording milli-voltmeter connected to the small magneto will record on the chart a curve of the watts measured by the integrating instrument.

If there be several generators in a plant, each with its integrating wattmeter, the magnetos can be connected in series and the recording instrument will record the total power of all the generators. It does not matter whether the integrating wattmeters are alternating or direct current, inasmuch as the small magneto circuits are entirely separate from those of the integrating instruments.

In Fig. 5 is shown a 5,000-ampere, 500-volt, integrating wattmeter, with the totalizing attachment. The integrating wattmeter is standardized with the totalizing attachment in place, so that its accuracy is not in any way affected. Repeated tests of the totalizing meter by comparing the power as measured by the integrating wattmeters and as determined from the area of the load curve drawn, showed difference of less than one per cent.

Aside from the advantages already alluded to, the makers claim for these combined indicating and recording instruments that they cost but little more than good indicating instruments, are simple and compact, and require less energy to operate than any other graphic recording instruments.

DIELECTRIC STRENGTH OF PORCELAIN

In the course of some laboratory tests on porcelain carried out by Sir William Preece an induction coil was employed and a spark gap between one-inch brass knobs was used to ascertain the voltage. The following results of the tests were obtained:

150,000	volts broke	down	2	mm. thickness of porcelain.
300,000	"	"	5½	" "
345,000	"	"	6½	" "
225,000	"	"	4½	" "

These voltages were estimated from the length of the spark, assuming that 10 cm. = 300,000 volts and 30 cm. = 900,000 volts.

A MODERN LAMP FACTORY

What do good light, pure air and pleasant surroundings mean to an employe? Whatever the answer may be, they mean just the same thing to the manufacturing business itself. These and the continuity of operations in lamp manufacture are what the architects and engineers had in mind when they designed and constructed the works of the Westinghouse Lamp Company at Watsessing, N. J., near Newark, and about 12 miles from New York city. A visitor to the works is struck by the unusually favorable condition under which the employes work. Tidiness is noticeable in every department. There is no crowding of employes; no foul air to make the employes drowsy and inefficient long before the day is done. High ceilings and plenty of windows make it possible for all to work in rooms well ventilated and always filled with a plentiful supply of pure air. Although these new works of the company have been operating but a few months, the reports of output in quantity and quality of the product stand as conclusive evidence that an employe will do more work and better work if placed amid surroundings that are healthful and inspiring.

The plant, which occupies a level site comprising 15 acres of land, consists essentially of three structures—main manufacturing building, 521 by 100 feet, three stories high, with a floor-to-floor height of 17 feet 4 inches; storehouse, 140 by 80 feet, four stories high, and power house, 83 by 66 feet. The foundations of the buildings have been made of sufficient strength to permit the addition of one or more stories when desirable.

All buildings are designed to be as nearly fireproof as possible, being constructed throughout of reinforced concrete.

Lighting and heating are supplied from a central power plant, which furnishes current for elevators, pumps, fans and for manufacturing operations.

The power house is directly back of the storage house and is designed to contain 1,000 horsepower of Stirling boilers. The present installation includes Westinghouse alternators, two direct-connected, of 250, 90 and 50 kilowatts capacity. There is also a 40-horsepower motor-generator set to supply direct current, while two air compressors supply air at from three to five pounds pressure for blow-pipe work, and at 100 pounds pressure for distribution through the manufacturing building. As a part of the power equipment, although placed in the manufacturing building, in the south end of the first floor, electrically driven, are 17 vacuum pumps.

All mechanical processes are operated by electric drive, and the latest and best appliances used in lamp manufacture have been secured. Many of the machines used in these new works have been developed by the company's engineers and the company has built the machines at the works. The factory is, therefore, designed and equipped to meet the best present-day methods in lamp manufacture.

The buildings are heated by indirect radiation, large stands of heating stacks being provided on the ground floor, through which the outside air is drawn by electrically-driven fans and distributed in galvanized iron ducts through all parts of the buildings. Hot water is circulated through the heating stacks by an electrically-driven centrifugal pump located in the boiler room of power house, where the water is heated by exhaust steam. On the top floor of the main building, where there are a large number of operatives, and where the manufacturing processes require a considerable number of open flames, an additional mechanical ventilating system is installed.

Special attention has been given to the matter of fire protection, and the entire plant is equipped with automatic sprinklers, which are supplied with water from a steel tank of 100,000 gallons capacity placed on a tower 100 feet high. Further fire protection is provided by a system of underground piping in the yard connecting with fire hydrants.

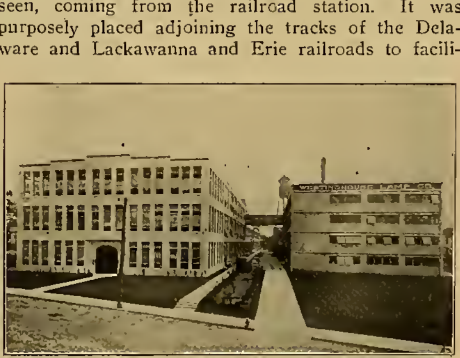
General View of Factory

Lamp Basing Department

A MODERN INCANDESCENT LAMP FACTORY

Drinking water is furnished on all floors at convenient intervals from a well drilled to a depth of 550 feet on the company's property. This well supplies all of the water needed for manufacturing purposes and fire protection.

The storage house is the first building to be seen, coming from the railroad station. It was purposely placed adjoining the tracks of the Delaware and Lackawanna and Erie railroads to facilitate the loading and unloading of material. In the storage house are received and stored all the raw materials required in lamp manufacture. Starting at the storage house and ending in the same building is the best system of shop routine known to the art of lamp making. There is interwoven with the manufacturing process so closely as to be part and parcel of it, a system of inspection and accounting, by means of which every important operation is inspected and approved by an expert before it is permitted to pass on to the next operation.



MAIN AND STORAGE BUILDINGS OF A MODERN LAMP FACTORY

Careful record is kept of the grade of work turned out by each operative, and an inspector once a month is able to prepare for the management a statement showing clearly the quantity and grade of work turned out by each employe.

The process of making the filament begins on the first floor of the main building. Here the filament undergoes 14 operations, beginning with the preparation for the brew, the squirting into fiber, its washing, and later the winding of the fiber on drums which are electrically driven, each drum having one attendant to feed the fiber. Other operations include the forming of the filament on frames, then the packing, first for the preliminary furnaces and later for the final furnaces, then the sizing, cutting and counting. The counting, which is done by weight, is most interesting to the visitor, who is naturally surprised to learn that this method of counting is correct within two per cent. and is far more accurate than would be counting by hand.

The treating of the filament takes place on the second floor at the south end of the main building. Here there are four long treating tables, each providing room for eight operatives. Each operative has facilities for treating simultaneously four filaments in separate chambers by hydro-carbon gas. After this, inspection is made as to the length and cross-section of the filament, and a check inspection is also made for resistance, bad shapes, etc.

Reference should next be made to the process necessary to make the stem through which the leading-in wires are inserted before being sealed in the glass bulb. Glass in long tubes is cut into short lengths and fed into what are known as flanging machines. In point of economy of operation these are most interesting, being entirely automatic and requiring but one attendant to keep them filled and in adjustment. The hoppers at the top of the machines are kept filled with these short lengths, which, as they pass through the apparatus, are heated on one end by gas flame and mechanically flanged.

After the insertion of the platinum-tipped leading-in wires, the anchor wire and the forming of the seal by an automatic clamping attachment which is a part of the stem-making machine, the finished stems now pass through an inspection and stores department to long tables for the mounting of the filament. Here the stems are arranged in frames and the filament attached preparatory to the straightening of the leading-in and anchor wires. From this point the mounted stems, containing the leading-in wires, anchor wires and filament, are passed through an inspection department to the sealing-in machines. However, the visitor should now give some attention to the glass bulbs which, after having been washed and placed in the stores and inspection department, are taken to the tabulating machines where by means of a needle gas flame a tube is welded to the end of the bulb, which later provides a connection through which the lamp is exhausted. A large number of special tubulating machines are arranged on tables and there is one operator to each machine.

At the sealing-in machines, the bulbs which have been tubulated, meet the finished stems whereon the filaments have been mounted. These machines are equipped with holders for both the bulbs and stems, which are brought together in the proper position by the operator, and by mechanically rotating in an eight-flame gas blast the stem is sealed in the bulb, the joint being airtight.

The special machines which are used for creating the vacuum in the bulb are provided with two cylinder exhaust or vacuum pumps. Each operator has two lamps on the machine at once, so that no time is lost during the process, as while one lamp is being subjected to the action of the exhaust pumps, the other is being sealed off, that is, the tube which has been attached to the bulb is in the tubulating process and through which the exhaust pump is drawing on the bulb, is fired off by hand into a symmetrical tip.

The bulbs which have been sealed in and exhausted, pass through the stores and inspection department for examination and counting, and then go down to the second floor for photometering. Here a force of experts test the lamps in darkened rooms to determine the rating, which is marked on the bulb in each case. From here the lamps pass to the first floor, where they meet the bases and where by means of rotating machines in which the bulbs are placed, the bases are affixed and soldered by gas fire. One operator attends to each machine. As the circulating carrier moves around, the finished lamps are removed and new ones are inserted one by one. The lamps now being finished, are cleaned and labeled.

Such of the lamps as are packed for immediate shipment pass over to the shipping room. Stock lamps are carried to the upper floors of the storage house and held subject to order.

A special branch of manufacture not yet mentioned is the tungsten lamp manufacturing department, which occupies most of the second floor in the main building of the works, and is devoted entirely to the manufacture of tungsten lamps, the larger quantities of which are made in the sizes of 40, 60 and 100 watts. In the manufacture of tungsten lamps it has been the aim of the company to produce a highly efficient lamp which should be known everywhere for quality. The operations through which the tungsten lamps pass are too numerous and varied to explain in this article. However, it may be mentioned that for the operation of this department a large generating station has been provided for the making of hydrogen and nitrogen gases, and close beside this station is a large holder in which these gases are stored.

In the front of the building (the north end) on the first floor are the private offices of the general manager and the assistant general manager; also of the correspondence and general offices, as well as the telephone exchange connecting with all departments. Immediately above these offices on the second floor, and reached by means of a double stairway built of concrete, are the offices of the treasurer and auditor, the engineering department and the manager of works.

On the third floor, and also in the front of the buildings, are the dining rooms. There is a large dining room for the office employes, the foremen and their assistants, and a private dining room for the officials of the company. Both dining rooms are directly connected with the kitchen. Two hundred employes can be comfortably fed here daily. The company provides meals to their employes at 25 cents each, which is less than the actual cost of the food served.

Within the organization has been voluntarily formed by the foremen and their assistants an organization known as the Westinghouse Foremen's and Assistants' Association. This organization has the hearty endorsement of the management of the company, and is encouraged in every way in its endeavor to foster and develop a spirit of co-operation, one with the other, in the work of the various departments.

Meetings for the discussion of subjects pertaining to the interests of the company and employes are held at regular intervals, and outings are frequently held during the summer months.

Before long it is the intention to equip, close by the works, a club, the building for which is now available. A library, reading room, shower baths, bowling alleys, billiard and pool, and other requisites of a modern social industrial club, will be provided.

Close by the works, on the company's property, is a baseball ground, upon which many of the employes play at noon and spare hours.

A commendable feature in the organization of the Westinghouse Lamp Company is a dispensary and a rest room for the employes. A regular physician has entire charge and gives undivided attention to this work, being on hand at all times to render medical advice or assistance when needed. Every needful thing is provided for the care of an employe who may be injured while in the performance of work, and other less important ailments are attended to, while the medicine is furnished without charge to the employes.

The entire work of designing and constructing was done by Westinghouse, Church, Kerr & Co.

Employes' Dining Room

Dispensary and Rest Room

VIEWS IN A MODERN LAMP FACTORY

ELECTRICAL PROJECTS IN TURKEY

Turkey has been very backward in electrical development, but it is now reported that a number of concessions have been granted by the Turkish government for important industrial undertakings, and two of these are of electrical interest.

In the concession for electric lighting and traction for Aleppo, the firman and "cahier de charges" covers also telephone and motor-car service and the monopoly for the sale of electric appliances for installation of electric lighting, etc., in private houses. This matter has been thoroughly examined by a Belgian engineer for a Belgian group of capitalists who were willing to take up the concession, but could not come to terms on the remuneration to be given. The terms of the convention and cahier de charges are considered to be perfect, and all documents, including plan and engineer's report, are at the disposal of anyone wishing to study them. The city of Aleppo has an estimated population of 197,000 inhabitants. It is the center of transit of certain exports from Asia Minor, Mesopotamia, Arabia and Persia, and is in a rich mineral district. There are copper mines, coal, and green marble quarries in the neighborhood of the city. The whole province is very fertile.

A concession for electric lighting and traction for Broussa covers the right to use waterpower in carrying it out. The convention and cahier de charges are said to contain certain articles which would not be acceptable to any capitalist, but the concessionaire could have these modified. These documents are also at the disposal of interested parties. The city of Broussa is situated at the foot of Mount Olympus to the north, was the ancient capital of Turkey, and is the seat of a governor-general. It has an estimated population of 120,000, and is noted for its iron and sulphur baths, which are much patronized and a source of attraction from the whole Turkish Empire. The principal industry of Broussa is silk, which is world-renowned.

Information in regard to these projects is obtainable from United States Consul-general Edward H. Ozmun, Constantinople, Turkey.

A MODERN STEEL FOUNDRY AND MACHINE SHOP

By C. A. Tupper

In a visit to the largest steel foundry of the West for the making of general castings, viz., that of the Falk Company at Milwaukee, Wis., one finds many features of special interest—above all, the economical arrangement and operation of the works, which, although complete in every detail, have nothing in their equipment or conduct not essential to the best results, and are so designed as to eliminate any unnecessary handling of material.

The Foundry

While the business of the Falk Company started in an establishment devoted especially to the manufacture of street-railway motor gears and track appliances, and that department still constitutes an important one, the attention of a visitor is directed particularly to the foundry and power house, the former a building 625 feet long by 295 feet wide at its largest part, of brick and steel construction, having a capacity of 1,500 tons monthly, where steel castings of any size required up to 40 tons capacity or more and varying widely in character, are turned out as readily as is usual in the work of a smaller plant devoted to a standard line of apparatus.

Pig-iron, brought in over the Chicago, Milwaukee and St. Paul Railway and left standing in cars on any one of the network of tracks which occupy a considerable portion of the Falk Company's ground, is unloaded by means of a Cutler-Hammer two-ton lifting magnet, at the end of a locomotive crane, and placed in piles between the tracks. An average analysis of each pile of pig-iron or scrap is then taken and the magnet is again called into play to load the iron directly into charging buckets, carried on small industrial trucks, which, after passing over a scale and having a record of the weight and contents of the buckets taken, are drawn up an incline to the charging floor of the furnaces and there lined up on tracks. Thence they are picked by charging machines, as needed, and fed to either one of the two acid open-hearth furnaces of 15 and 20 tons capacity.

A tilting hearth, supported on a heavy framework of structural steel, forms the central portion of each furnace, and checker chambers and slag pockets are constructed at the ends, flues being provided for the admission of air in proper quantities to the combustion chamber.

The fuel in the furnace is oil, which, after delivery in tank cars, is stored in three underground steel tanks in a concrete vault holding 15,000 gallons apiece. From these tanks the oil is pumped to the furnaces, and a mixture of oil and air fed in together. After the resultant gas passes over the hearth and has given up most of its thermal units, it exhausts on one side of the furnace into the checker chambers above mentioned, and the residue of heat contained in it is absorbed by the brick of which these chambers are composed. Then the direction of air entering the furnace is changed, so that it comes in on this side and is heated, discharging again through the checker-work on the other side and preparing it for the next current of air. Four heats a day can be taken when required. Special heats of nickel and chrome-steel castings, as well as those requiring a very high carbon or particularly high-tensile test, are made when orders are of sufficient tonnage.

From the tilting furnaces the liquid metal, after having the "doctor" added, is taken by four 25 to 30-ton oil-heated ladles, with bottom taps, two of which are used simultaneously, and is carried by traveling cranes, as usual, to the various parts of the foundry where the castings are to be poured. With large molds, one of these ladles is emptied in a relatively short time.

The loam and dry-sand molding is done in a part of the foundry distinct from the green-sand floors. The foundry, which has been built with high head room, is served throughout its length by eight large traveling cranes built by Pawling & Harnischfeger of Milwaukee. Two of these have an 80-foot span, with a capacity of 50 tons each; five are 50-ton cranes, designed to carry 30 tons each, and there is one of 25-foot span rated at 10 tons. All of the cranes have large overload capacity. Jib cranes, telphers and tracks running throughout the yard and shops complete the transportation system.

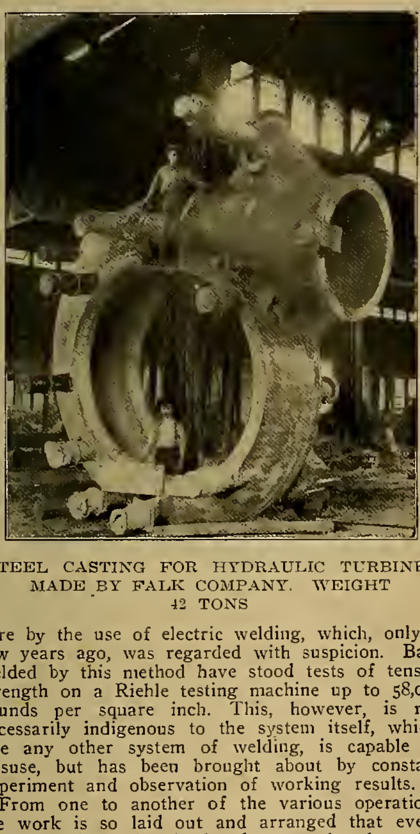
The various sections of this plant are provided with the equipment of a thoroughly up-to-date foundry, including molding machines of the power squeezer and hinged types, the adjustable table pattern and the roll-over, straight-drop style, pneumatic hoists, cold cut-off saws, sand mills with self-discharging pans, pneumatic shaker screens and riddles, machines for straightening core wires or gaggers, hack saws, tumbling barrels, crucible outfits, bench tools and other types of modern machinery for producing and handling a large output to the best advantage.

To properly clean castings is as essential as to properly mold them, and the facilities afforded here for this work are of the best. After the castings have cooled they are taken by cranes if large, or on rail-tracks if small, directly to the cleaning department, which is an 80-foot integral extension of the main foundry, 155 feet wide, and is fitted throughout with pneumatic devices, such as hoists, chipping hammers, sand blasts, surface grinders of the swing-frame type and saws of various sizes capable of removing heads ranging from those of the smallest dimensions to weights of two to three tons or more. At one end is a sand-blast room with an exhaust fan in the side to draw off the flying dust. Compressed air for this and the other departments is brought in direct pipes from a main duct which runs to the center of the foundry in a straight line from the power house.

Adjacent to the foundry and served by a 20-ton crane, are two annealing furnaces especially designed and built by the Falk Company, of sufficient size to admit the largest castings, and so constructed as to obtain an evenly applied heat throughout, thus assuring uniformity in the texture and general quality of the castings. By means of constant experiments and tests the annealing in these furnaces is kept at a high state of efficiency.

The floor of the foundry is lighted in the daytime by side windows and a monitor extending the entire length of the building, which has ventilator windows on each side. At night, arc-lamp illumination is used. The height of the building is such as to give ample space for the gas, smoke and steam to rise and pass off to the air through the ventilators.

Unusually successful results have been obtained



STEEL CASTING FOR HYDRAULIC TURBINE, MADE BY FALK COMPANY. WEIGHT 42 TONS

here by the use of electric welding, which, only a few years ago, was regarded with suspicion. Bars welded by this method have stood tests of tensile strength on a Riehle testing machine up to 58,000 pounds per square inch. This, however, is not necessarily indigenous to the system itself, which, like any other system of welding, is capable of misuse, but has been brought about by constant experiment and observation of working results.

From one to another of the various operations the work is so laid out and arranged that every man does just what he has been employed to do; for example, molders actually mold, and do not perform such operations as pulling out castings, taking care of the bottom boards, wetting down the sand, "cutting-over," which can be done just as readily by assistants or laborers, whose pay is much less. The molders are also relieved from participating in or superintending the pouring, there being a special pouring gang for this purpose.

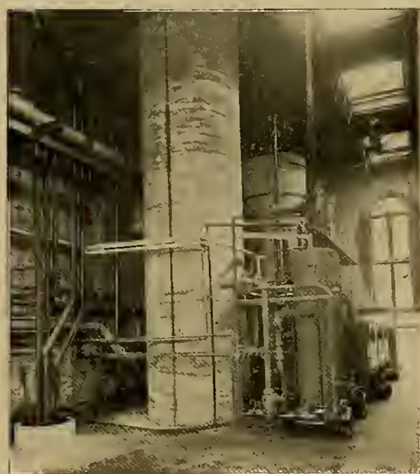
As a necessary adjunct to the foundry, the Falk Company maintains its own chemical testing laboratories, which, like all the plant, are thoroughly modern in equipment. The testing laboratory has a Riehle testing machine of 100 tons capacity, a LaChatolier pyrometer, Sieman's water pyrometer and a complete set of photo-microscopic apparatus. This enables the company to secure a complete and minute record, physical and chemical, of all material used in the furnaces and of the resultant castings.

At one side of the works is an emergency hospital, where immediate surgical and medical aid can be rendered in case of accident needing professional attention.

Pattern Shop and Storage

Lumber for use in the pattern shop is thoroughly seasoned and a large quantity kept constantly on hand, as the importance of using material in the proper condition for castings, thereby insuring against shrinkage or distortion, is not to be overestimated in steel-foundry practice. The company makes a specialty of turning out patterns for customers, particularly for duplicate work, or that of an intricate nature requiring special care in shrinkage measurements.

All patterns made in the Falk works or received from the outside are carefully numbered and placed in a steel-frame, concrete-pattern storage building, well arranged with shelves and partitions, where a card record of them is kept. The building is fireproof, with fire walls dividing it into compartments. The pattern shop is equipped with woodworking



VIEW IN BOILER ROOM OF THE FALK COMPANY, MILWAUKEE

machinery of the latest type. A very interesting tool used in this department is also one for cutting gear pattern teeth, which is built by the Falk Company itself.

Railway Department

The railway department of the Falk Company, which now serves street and interurban traction companies, as well as steam roads, turns out cast-steel gears and forged steel pinions, girder-rail and high T-sections for city railways, low standard sections of from 56 to 100 pounds for steam and interurban lines, and a great variety of special work. This department has an exceedingly well-equipped machine shop, including planers and lathes, drilling and boring machines, gear cutters, drills, milling saws, key seaters, milling machines, boring mills, shapers, grinders, rail saws, expansible reamers, hydraulic presses with accumulator and motor-driven pump, and some very efficient and accurate pinion cutters.

In the forge shop are three steam hammers built by the Niles-Bement-Pond Company, two of 1,500 pounds and one of 1,000 pounds capacity, together with the Buffalo Forge Company's blowers and forges, and a full complement of forging tools. The heating furnaces are of standard design. In this shop are produced monthly thousands of forged blanks for street-railway-motor pinions. The frogs,

INTERIOR OF POWER HOUSE IN THE PLANT OF THE FALK COMPANY

switches, etc., manufactured are of the types now standard in street and interurban-railway service, with improvements made by the company that largely strengthen their wearing qualities.

Of these the most popular types made by the company are the hardened-center, manganese-insert and the solid cast-steel types. The steel-bound integral type of construction is also one now being largely turned out by the company. However, built-up "regular" special work is still built to a considerable extent. Rapid growth of the interurban system of electric roads has also created a demand for special work of the standard steam-road type, and to this the company is now paying particular attention.

All of the work of the railway department, whether complicated or simple, is laid out and assembled before shipping. Each piece is marked and detailed key plans are sent out, which can be readily understood by ordinary track foremen. The laying out of the work is greatly facilitated by means of a special revolving crane of five tons capacity, which makes a complete circle 150 feet in diameter. It is also a means of transferring material from one to another of the buildings immediately surrounding, each of which has tracks radiating toward the center of the circle served by the crane and projecting within this circle, so that the material can be readily loaded into cars and run to any place desired.

One feature of the company's railway work, which is now so well known as not to require extended mention, is that of cast welded joints for lengthening the life of old rails. This system is operated for customers, either directly by the company or under lease from it. The apparatus required for the purpose consists of an electrically operated compressor and sand-blast machine, a portable cupola and motor-driven blower, a flexible-shaft grinding machine, clamps of various forms, molds to suit various sections of rail, wrenches, etc.

Power Equipment

All of the machinery in the entire works of the company, which does not take compressed air, is electrically operated, principally by individual motor drive, although short lines of shafting are used in such places as the pattern shop, cleaning department of the foundry, etc., where numbers of light-running machines make this arrangement the most advantageous. Electric current and compressed air are supplied from a new central power house, which is one of the most interesting features of the Falk Company's works. Neatness, orderly ar-

CENTRIFUGAL PUMPS FOR BAROMETRIC CONDENSERS IN FALK COMPANY'S PLANT

rangement and absence of a large percentage of the usual quantity of piping, are points which strike the visitor's attention immediately upon entering; but as the station design is followed out it soon becomes apparent that these are only an index to the general character of the plant, which was equipped, in all of its main details—engines, generators, compressors, condensers, circulating pumps, etc.—by the Allis-Chalmers Company of Milwaukee, Wis.

The machinery consists of a cross-compound condensing Reynolds-Corliss engine, with cylinders 20 and 42 inches by 42-inch stroke, operating at 100 revolutions per minute, and coupled to a generator of 550 kilowatts capacity, delivering direct current at a terminal pressure of 250 volts; an 18 by 24-inch simple condensing Reynolds-Corliss engine of the vertical pattern, direct-connected to a 125-kilowatt generator, with characteristics similar to the larger machine, and two air compressors, one two-stage and the other single-stage, having capacities of 2,500 and 1,800 cubic feet of air per minute. The steam end of each unit is an engine of the same type as that driving the main generator.

Richardson sight-feed oil pumps lubricate the cylinders of the engines, and the gravity system is used for all the units. The oil flows, after use, to a five-chamber Turner filter in the basement and is pumped back to a 200-gallon tank located under the ceiling of the engine room, by means of a pump of the Platt Iron Works type. The capacity of the system is 450 barrels daily.

In the boiler room are three Wickes vertical water-tube boilers, designed for a working pressure of 150 pounds and rated at 300 horsepower each, with furnaces and grates of the same builders' standard construction. These boilers are connected to a 12-inch header, which divides into six-inch feeders serving the several engines. Steam is supplied at 150 pounds pressure through large separators connected with Squires traps. The piping, erected by the Pittsburg Piping and Equipment Company, is of extra strength. Elbows were dispensed with as much as possible and long-turn bends used instead, those on the steam feeds to the engines being bent to a six-foot radius. Crane valves, with rising stems, are employed throughout, and there is a very complete system of steam, water and air control, which can be operated from either the engine or boiler-room floors, thereby insuring prompt shut-off in case of accident.

All water for boiler feed is taken from the city mains and first passed through the jackets and intercoolers of the air compressors before flowing to an open Crowley heater. Thence it is lifted to the boilers by one of two Burnham outside-packed plunger pumps, each 14 inches by 8 inches by 16 inches, of the Union Pump Company's design, the second unit being held in reserve. There is also a 7-inch by 4¾-inch by 8-inch Prescott pump, used to work the turbine flue cleaner and for boiler washing. Only half the space in the boiler room is at present occupied, and reinforced-concrete foundations have been laid for another battery of boilers. In the engine room a rearrangement of the units can also be readily made to provide for additional capacity.

Each furnace has independent dampers between it and the breeching, which connects with a reinforced-concrete stack, 180 feet high, having natural draft through an eight-foot flue. The main damper is controlled by a Richard Thompson regulator operated from the engine room.

Each of the engines is connected to one of four Tomlinson barometric condensers. The water flows from a nearby river to a deep well, where it is elevated to the condensers by means of Allis-Chalmers steam-driven centrifugal pumps, one pump supplying two condensers. The latter are equipped with equalizer pipes, thereby maintaining a uniform vacuum on the different units. The suction pipes to the centrifugal pumps are provided with sliding screens, which can be taken up at will, insuring a free intake to the pumps at all times. There is also a third similar pump, which is used to remove any accumulation of mud in the bottom of the well; it may also be used to pump water from the deep well through the jackets and intercoolers of the air compressors and supply the heater for boiler feed in case of failure of the city mains. The exhaust of the auxiliaries goes to the Crowley heater, to which all traps also discharge.

Coal is brought in on an inclined track and dumped over enclosed bunkers having a capacity of 400 tons, the cars being pulled up by means of an electric hoist. As the bottom of each bunker is pitched toward the furnaces, this arrangement puts the coal from the car to the furnace door practically without shoveling.

The switchboard was built by George F. Rohn of Milwaukee and equipped with standard apparatus, including Cutler-Hammer switches. The distribution of current to the shops is through underground cables, which feed a network of wires run in iron piping to the various departments where power is needed. The plant is thoroughly equipped with modern appliances for conducting efficiency tests and gathering daily records, all of which are kept in constant service, and this has a very appreciable effect upon the operating economy.

As the Falk Company started at its present site in 1899 with a plant extending over less than a quarter of an acre, and the present works have now an area of 50 acres, including a covered floor space of nearly 10 acres, it is apparent that conditions leading to the rapid expansion of the business must have been uncommonly favorable. Among these, the principal ones are undoubtedly to be sought in the management of the works themselves, an interesting feature of which is the treatment of the employes and their relations to the officers and heads of departments.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, September 17.—Owing to a decision which was reached not long since by the Council of Ministers, the French War Department is to organize a military electrical force which will play an important part in the army. A certain part of the engineer corps will be trained for this purpose, setting apart a determined number of men in each regiment of the corps. This part will form an electrical section, and the soldiers will be trained so as to be able to use all the applications of electricity which enter into army tactics, and electric lighting, motors, etc., especially. General Picquart, the minister of war, has now addressed a circular letter to the commandants of the army corps in view of organizing the electrical sections. The first step in carrying out this measure has been taken at Paris, where one of the large electric-lighting plants in the center of the city has been placed at the disposition of the engineer corps, and the soldiers will be trained in handling the apparatus. It is probable, although no reference is made to the subject, that the recent strikes of electrical workmen and central-station employes in Paris had something to do with this measure. In case of a general strike, which was threatened not long ago, it had already been decided to replace the strikers by the troops, and in fact a regiment was brought to Paris especially for the purpose when a strike was feared last month. The strike did not take place, however. A large number of trained men will be a safeguard against any future trouble due to central-station strikes, and the soldiers will be detailed on the spot within a few hours' notice.

There is some talk of a new tunnel to be run through Mont Blanc, in order to give a connection for an international railroad line between France and Italy. No doubt the line, at least in and near the tunnel, will be electrically operated, as in the case of the Simplon Tunnel.

In the neighborhood of Orleans it is proposed to build an electric tramway along the bank of the Loire which will run between Contres and Selles, taking in a number of communes. The Southwest Electric Company, which may be called upon to operate the road, is probably to have the contract for the electric lighting of the different communes of the region.

Among other recent projects in France, I may mention an electric-tramway line in the Rhone district running between Sathonay and Camp. At Troyes, it is proposed to organize a company for the building and operation of a light and power plant for the city. The South Electric Company proposes to install a motor pumping plant for the city waterworks, at an estimated cost of $10,000. Although the first cost of the plant will be high, it is figured that it will give an economy of $5,000 yearly over the present system. The Municipal Council is considering the matter at present. At Rouen there is considerable work being carried out in order to increase the facilities of the port (on the Seine), and the Chamber of Commerce has been taking measures for the construction work, which is to be done during the present period. Among other material, there will be installed eight electric capstans, which, with the wiring, will cost $30,000. There will be six electric cranes mounted on the left bank for unloading coal from the boats.

The Swiss government has decided definitely to take over the Simplon Tunnel and railroad, for the plant has proved all that was required of it, and the new electric locomotives come up to the expectations.

In the central electric station of Brussels there will soon be installed two air compressors driven by electric motors, together, with the piping and reservoirs. The first of the compressors is designed to give about 500 liters of compressed air per minute, while the second will supply about one-third of this capacity. D. DE C.

GREAT BRITAIN

London, September 18.—The Board of Trade has now reported upon the fire in the tunnels of the City and South London Railway a short time ago, which caused so much consternation at the time owing to the firemen taking some two hours in getting at the outbreak in consequence of the smoke in the tunnel driving them back. Wooden ties were in use on the particular portion of the line, and from some reason these caught fire, although there was more smoke than flame. Conflicting evidence was given at the inquiry, but the electrical engineer admitted that he had known small fires to occur owing to a leakage of current between the power rail and the running rail, coupled with the existence of an accumulation of iron dust and carbon dust on the ties and insulators. The inspecting officers of the Board of Trade rather incline to the view that this is what occurred on the occasion of the last fire, the seriousness of the outbreak being accounted for by the volume of dust present. They recommend that considerably greater attention should be paid to cleanliness in the tunnels; that a liberal use should be made of whitewash in order so more easily detect dust; the filling up of the inverts, especially in the large tunnels should be carried out; no electric wires or cables should be carried below or between the ties; the use of wood should be eliminated as far as possible, and that all wooden platforms should be replaced by granolithic. It is only fair to point out that the City and South London is the pioneer tube railway in London, having been opened in 1890.

The agents of a German electrical firm are now introducing into England electrically driven vehicles equipped with the Edison battery, these generally consisting of 64 nickel-iron cells. The vehicles—broughams, landaulets and victorias for town use—are guaranteed to run about 56 miles on one charge, and the maximum speed on the level is claimed to be 20 miles per hour.

Good progress is being made with the Manchester electrical exhibition, where some 250 exhibits will be collected. The area of the buildings is about 100,000 square feet, considerably larger than that available in London on the occasion of the 1905 exhibition.

An effort to introduce surface-contact electric traction upon the Dolter system, into the provinces has not proved particularly successful. It is true the system is working more or less successfully at Hastings and Torquay, but it has been substituted by the overhead system at Mexboro, in Yorkshire, at the request of the inhabitants, while the same promoters, who obtained parliamentary powers for installing the system in Folkstone, Sandgate and Hythe, three south-coast watering places, are now seeking the permission of the respective councils to substitute the overhead system. The reason for this change of front is said to be the extra cost of the surface-contact system and the present bad state of the money market.

Some years ago, as the price of its consent to the South London Electric Supply Corporation supplying in its district, the Lambeth Council insisted upon the erection of a refuse destructor and the destruction of all the parish refuse free of charge. But the working of the destructor proved a nuisance to the district, and it was found impossible to abate it. The Council, however, insisted on having its pound of flesh, and as the price of releasing the company from the obligation to destroy the refuse, it claimed a supply of electricity free to the value of $5,000. This is now being given and is used for the public buildings. The company gets no quid pro quo for this, and, incidentally, has had to scrap the destructor plant, which originally cost $525,000. G.

NEW YORK

New York City, September 26.—Judge Ward of the United States Circuit Court has handed down a decision against the Metropolitan Securities Company for almost $5,000,000 in the suit of the receivers of the New York City Railway Company and the Metropolitan Railroad Company. Adrian H. Joline and Douglas Robinson. The court gives the receivers permission to enter judgment against the holding company of the traction interests in this paragraph of the decision: "The defendant's motion to dismiss the complaint on the merits is denied, and judgment may be entered for the plaintiffs in the sum of $4,964,000, with interest at six per cent. per annum on $1,245,754.33 thereof from October 18, 1907, and on $3,718,245.67 from March 8, 1908."

Some of the transactions of the holding company are questioned, among these the transfer of nearly $1,000,000 from the Morton Trust Company to August Belmont & Co. At all points the court decides in favor of the contentions of the receivers.

The Public Service Commission contemplates fixing a joint rate between the lines of the Metropolitan Street Railway and the Fifty-ninth Street crosstown line within a short time. In the course of a recent cross-examination of General Manager Oren Root of the Metropolitan it was brought out in the course of his examination that the amount lost in fares not turned in or not collected almost equaled the amount formerly paid on the lease of the crosstown line. The actual loss through unpaid fares was said to be something like eight per cent., and the yearly loss to the company, on that basis, about $1,400,000, which sum, Commissioner Maltbie remarked, would represent a capitalization of $20,000,000 to $30,000,000.

South American buyers of pottery wire-ducts for the cables of the telephone system of Bahia Blanca, a city in Argentina, 400 miles south of Buenos Ayres, are in such a hurry to get the telephone system installed that they have ordered a special train to carry the wire-ducts from the Ohio factory to New York, and have chartered a special steamer to hurry the order down to South America. The "rush" order comes to the H. B. Camp Company from the United River Plate Telephone Company, which operates in Argentina under the Bell system. Bahia Blanca is a port with 45,000 inhabitants, the converging point for several railroads from the interior, and is said to have doubled its population in the last five years. It has become rapidly modernized, and is impatient for up-to-date improvements.

It is the intention of the Public Service Commission to work for the restoration of the Fulton Street car line for the reason that it is a needed means of communication between the piers on the North and East rivers in the lower part of the city. A group of capitalists is ready to form a new company to run cars over the Fulton Street route with a three-cent fare if a franchise can be obtained which will not call for an extremely large rental. The terms of such a franchise would have to be fixed by the Public Service Commission acting jointly with the Board of Estimate.

The officials of the Brooklyn Rapid Transit Company after a conference have decided not to pay the bill for paving, amounting to $332,000, which was made out and presented by order of Borough President Coler. According to a state law the company operating the line must pave between the car tracks and for two feet on either side. The B. R. T., according to a verbal agreement with William C. Redfield when he was commissioner of public works, has paved between the tracks, but has left the two-foot strips on the outside of the tracks for the city to attend to. It is for this that Mr. Coler would collect. He holds that Redfield had no right to make such an agreement and that a verbal agreement of such nature is not binding. The bills will be given to the corporation counsel for collection. W.

NEW ENGLAND

Boston, September 26.—The Massachusetts railroad commissioners rendered an important decision this week, denying the petition of the Fitchburg and Leominster Electric Railway Company for authority to issue 2,500 new shares of stock at par. It appears that the stock is valued considerably above $100 per share in the market, and the "melon-cutting" plan is thwarted by the commission, which says that the price of $100 is "so low as to be inconsistent with public interests," and expresses the opinion that the money should be raised by an issue of shares "materially less than 2,500 at a correspondingly higher price."

The Boston Suburban Electric Company has resumed dividends on its preferred stock at the rate of $3 per annum, after a lapse of nine months, the six-cent fare put into effect a few months ago having made this possible.

Chester Parker, electrician at the transforming station of the Haverhill and Amesbury Electric Railway at Salisbury, was killed by an electric shock while trying to extinguish a fire at the switchboard which had been caused by a flash of lightning that entered the station during a thunderstorm last Thursday night.

The town of Wakefield has voted to substitute incandescent lights for the arc lights now in use there for street lighting. B.

EASTERN CANADA

Ottawa, September 26.—The Bell Telephone Company has secured a renewal of its exclusive franchise for five years from the city of Hamilton, Ont. The company is to pay $4,000 instead of $2,000 a year as formerly.

The announcement made at the last session of the Dominion Parliament that the government hoped to arrange for an Atlantic cable rate of 10 words for a shilling seems about to materialize. The government, it is now announced, has given the matter serious consideration and an arrangement will shortly be made whereby this cheap rate will go into effect. It is expected that a contract will be made with one of the present cable companies, but if not a new company is to be formed, which will be subsidized by the government.

Mr. Marconi, who was here recently, stated that much of the apparatus installed at Cape Breton is on altogether too light a scale. It is intended to duplicate the entire plant and make such extensions as will cope with a much larger business than is being done at present. The company has all the business it can handle with the present apparatus, it is said. Mr. Marconi further said that it was intended to establish a land service of wireless telegraphy in order to handle the business for the ocean service.

English financiers interested in Canadian power concerns are showing some public resentment at what they call the socialistic action of the Ontario government in connection with the hydro-electric commission. It is alleged that the government has not shown proper consideration for British investors, of whose money a million pounds sterling is at stake, when the government, through the commission, is building out of public funds, raised at 3½ per cent., an electric distribution plant to compete with one in which British capital is invested and which was encouraged by the same government, subject to a royalty payable to the government. W.

WESTERN CANADA

Winnipeg, September 25.—Mayor Henderson of Lethbridge, Alb., is advocating an electric street-railway system for the city and favors granting a franchise to some company. Calgary, an adjacent city, estimates its street-railway system will cost $250,000, and Edmonton, another Albertan city, figures on a cost of $235,000 for 12 miles of line.

Cecil B. Smith has been instructed to prepare plans and specifications for a municipal electric-light and power plant for Lethbridge, Alb. Mayor Henderson may be addressed.

Civic bodies in Regina, Sask., are advocating a scheme for the development of municipal power at Dirt Hills, a distance of 60 miles from the city. So far no definite agreement or proposal has been made. Mayor Smith may be addressed.

The City Council at Nelson, B. C., has decided to reduce the price of electric light supplied from the municipal power plant. In future the rates per kilowatt will range from 12 cents for the first 50 kilowatts to four cents for all over 2,000 kilowatts.

The Kaministiquia Power Company, with head office at Fort William, Ont., has made an offer to the Port Arthur City Council to build a distributing plant in Port Arthur. It is expected the city and the company will reach an agreement in the matter.

The British Columbia Electric Street Railroad Company, through its branch, the Vancouver Power Company, is now arranging for lining with wood its tunnel from Lake Coquitlam to Lake Buntzen, a distance of 2,773 feet. This tunnel is hewn through the solid rock and is of such dimensions that a man standing upright in a boat can safely float through it. The work will cost about $200,000.

The offer of the Winnipeg Electric Company received by the city of Winnipeg, Man., was misinterpreted in some way. It now appears that the company wanted the city to agree to take 10,000 horsepower at $18.40 per horsepower on the 24-hour rate, paying $184,000 for the power whether used or not. F. E. Cambridge is the city electrician and Cecil B. Smith, the civic-power expert. R.

NORTHWESTERN STATES

Minneapolis, September 26.—The City Council of Atlantic, Iowa, will install a 50-kilowatt and a 30-kilowatt generator and a switchboard.

The plant of the People's Gas and Electric Company at Burlington, Iowa, is to be entirely rebuilt at a cost of $100,000. Improvements to the value of $40,000 will be put in immediately.

J. G. Robertson of St. Paul, Minn., has the contract for the improvement of the electric-lighting plant at Cumberland, Wis. A 100-kilowatt generator will be installed.

W. H. Tyrrell has been appointed receiver for the electric-light plant at Delavan, Wis., following proceedings instituted by the bondholders.

Surveys are being made between Dubuque and Maquoketa, Iowa, for the Clinton, Maquoketa and Dubuque Interurban Railway.

The Gibbon Electric Light Company of Gibbon, Neb., has been incorporated by H. F. Flint and others with a capital stock of $10,000. Work on the construction of the plant will commence at once.

Owing to the failure of the Kaukauna Gas and Electric Light and Power Company of Kaukauna, Wis., to make improvements as ordered, a renewal of its franchise, which will expire on October 14th, will not be granted.

A joint traffic agreement has been reached between the Eastern Wisconsin Railway and Light Company and the Wisconsin Electric Railway Company for a through service between Fond du Lac and Neenah, Wis.

The gross earnings of the Minneapolis General Electric Company of Minneapolis for July show an increase of $9,996.

The Mitchell Power Company of Mitchell, S. D., let the contract for the erection of an electric-light and gas plant to the Goetz Construction Company of Yankton, S. D. The contract price is about $6,000.

The storage-battery plant of the Milwaukee and Northern Interurban Road at Weeden station, Wis., was damaged by fire to the extent of $15,000.

Fire destroyed the municipal lighting and water plants at Waverly, Iowa. The loss was nearly $50,000, with insurance of $8,000.

A local meeting was held recently to discuss the question of supplying Cedar Grove, Wis., with electric light.

The Virginia Light and Water Company of Virginia, Minn., will shortly erect a supplementary steam plant.

The removal of the Warner Arc Light Company from Muncie, Ind., to Wilton Junction, Iowa, is proposed.

The Wisconsin (Bell) Telephone Company has absorbed the Western Wisconsin Telephone Company, which had exchanges at Arcadia, Galesville, Trempealeau, Fountain City, Blair, Ettrick, Whitehall and Independence, Wis.

Bids have been taken for the construction of a fireproof building for the Tri-City Telephone Company, at Clinton, Iowa.

The Nevada Mutual, Roland Mutual, Cambridge Independent, Maxwell and Short Line telephone companies have been consolidated to form the Story County Independent Telephone Company of Nevada, Iowa. F. M. Boardman will be at the head of the new concern. R.

PACIFIC SLOPE

San Francisco, September 23.—The Great Western Power Company, whose power plant on the Feather River is nearing completion, has applied to the city council of Sacramento for a franchise for a distributing system in that city. The company's officials state that it will have 120,000 horsepower available for power purposes in Sacramento. The same company has begun preliminary work on the erection of a steam auxiliary plant on Sessions Basin, near the foot of Seventh Street, Oakland. On the latter plant approximately $2,000,000 will be spent.

Electrical power and railway men are interested in the experiments now being made by the Southern Pacific Railroad Company with gasoline motor cars. So far six of these cars, with a capacity of 70 persons each, have been received, and it is given out that 50 have been ordered. The cars are now being used on short runs out of Sacramento to Folsom and to Fair Oaks and out of Fresno to Pollasky and Kerman. Apparently the purpose of the company is to place these gasoline cars on all short runs where it is feeling the effects of electric-railway competition.

This week the two wireless telegraph stations installed by the Mexican government on the peninsula of Lower California were put in communication with San Francisco. Hitherto there has been no direct telegraphic communication to Lower California.

The California Gas and Electric Corporation of San Francisco has issued a statement showing the earnings of the company's property covered by the unifying and refunding bonds of the company for the year ended July 31, 1908. The statement shows gross earnings, $7,830,392; operating expenses, taxes, etc., $5,235,408; sinking fund, $225,060; balance, $2,369,924; interest, $444,700, and surplus, $1,925,224.

The Northern Light and Power Company of Redding Cal., is making surveys for a distributing system in Redding for light and power purposes. The officers promise to supply customers by January 1st.

The City Council of Chewelah, Wash., is in the market for 1,000 16-candlepower incandescent lamps.

Douglas Belts, president of the First National Bank of Pilot Rock, Ore., and others have filed claims on the waters of the John Day River in Oregon for power purposes and will organize a company to develop electric power.

Preliminary to the installation of new apparatus made necessary by the ordinance requiring all wires in the business section of Portland, Ore., to be placed underground, the Portland Railway, Light and Power Company is having plans prepared for extensive alterations in the power receiving and distributing station at Seventh and Alder streets, Portland.

The town trustees of Healdsburg are asking for bids for the reconstruction of a municipal power line. A.

INDIANA

Indianapolis, September 26.—The Winona Interurban Railway Company, which operates a line between Warsaw and Goshen, has established a school of instruction for motormen in its employment. The managers have established a rule that in the future motormen must understand all of the working parts of their cars. To this end an order has been issued that every motorman employed by the company must spend one month, on pay, in the car barns and repair shop at Winona Lake to receive instruction concerning the operation of motors, controllers, dynamos and other parts of the equipment. The men will be required to watch carefully the repairs on damaged cars.

The high-tension terminal at the power house of the Northwestern division of the Terre Haute, Indianapolis and Eastern Traction line at Lebanon was destroyed by fire, when a break occurred in a high-tension wire. All the transmission wires were burned in two and service was crippled for two days.

The officials of the Indianapolis, Columbus and Southern Traction Company say they now have an ideal distribution of power between Indianapolis and Seymour. Sub-stations have been built at Southport, Franklin, Edinburg, Columbus and Reddington. There is also a portable sub-station in a special car which can be taken to any point on the line where traffic is heavy and quickly placed in service.

The Mishawaka Hydraulic Company has brought suit to compel the South Bend Manufacturing Company to lower its dam in the St. Joseph River. The complainant company alleges that the South Bend company has been continually making additions to the height of its dam until the back-water has seriously interfered with manufacturing plants depending upon the Mishawaka Hydraulic Company for waterpower. The complaint asks that the South Bend company's dam be lowered and a judgment for costs be given.

The City Council of Plymouth has accepted a bid from C. D. Snoeberger for a 20-year franchise to operate an electric-light plant in the town. Competitive bidders are threatening to enjoin the City Council from carrying out the contract.

The Citizens' Telephone Company of Martinsville is asking for a new franchise, to run 25 years, and to give the company the privilege of increasing the rates for residence telephones from $1 to $1.25 a month, and for business and office instruments from $2 to $2.25 a month up to 1,000 telephones; over that number, an additional increase of 25 cents on each telephone is to be permitted. S. S.

ILLINOIS

Peoria, September 26.—The Galatia, Harrisburg and Southeastern Railway Company proposes to build a line from Galatia to Harrisburg, a distance of 10 miles. The grading has been completed, and the bridges built.

The River Forest Railroad Company has been incorporated with a capital of $5,000, to construct a line from the west line of the village of Oak Park to the west line of the village of River Forest, both suburbs of Chicago. William T. Nelson heads the incorporators and first board of directors.

The City Council of Peoria has passed an ordinance requiring the railroad companies to erect and maintain an arc light at every street crossing.

That the line connecting St. Louis and Indianapolis will eventually be built is seen from the work now being done by the Mattoon, Shelbyville, Pana and Hillsboro line. The engineers are now securing the right-of-way near Shelbyville, and work is to be commenced this fall. The line leaves Mattoon in a southeasterly direction and from Windsor parallels the Big Four railroad track to St. Louis.

A large flywheel of the Springfield Utilities Company burst at Springfield this week, causing a loss of $3,000 by wrecking the engine and one of the generators. Large pieces of the flywheel went through the roof and floor. By the breaking of a steam pipe the boilers were bled and power shut off from all lights and street-railway cars for 45 minutes.

All the electric companies in Springfield are making great preparations for the State Fair, that will be held there next week. The railway company has over 40 cars for extra use. The city generally and especially the State House will be decorated with electric lights. The Illinois Traction Company is prepared to handle the crowds and will use trailers. An information bureau has been installed by the company, which will have 50,000 postal cards with views of Springfield to give to patrons.

The City Council of Springfield has granted to the Springfield, Clear Lake and Rochester Railway Company a franchise to operate in the city. Within 90 days it must commence the operation of its cars and must maintain its principal office and shops within five miles of the city. V. N.

PERSONAL

Mr. Thos. G. Grier, author of "On the Canal Zone," will deliver an illustrated lecture on the work at Panama at Association House, Chicago, on the evening of October 13th.

Mr. Chas. D. Shain of New York, who was a prominent figure in the electrical industry before he engaged in another line of business, called on a number of his friends in Chicago early in the week.

Thomas A. Edison, accompanied by his wife and daughter, has been traveling in the West. He was recently registered at the Knutsford Hotel, Salt Lake City, Utah, and expressed himself as pleased with the city and its future. Later he visited Denver, Colo.

Dr. Karl Georg Frank, representing the Siemens & Halske and Siemens-Schuckert companies of Berlin, was in Chicago this week. He is observing electrical development in the United States generally, with the more particular purpose at present of introducing German instruments of precision in the United States. He has an office in the Hudson Terminal Building in New York.

Mr. A. D. Mackie, who has been in charge of the new-business department of the Peoria Gas and Electric Company and also has had charge of the advertising of the Utilities company at Springfield, has accepted the management of the Springfield (Ill.) News. Mr. Mackie will make his headquarters in Springfield, and will continue to handle the advertising of the two electric companies.

Mr. George Arrowsmith has been appointed superintendent of the Strahorn electric-light and power interests in the Yakima Valley in the state of Washington. Mr. Arrowsmith is now superintendent of the Northwest Light and Power Company in North Yakima, Wash. It is understood that the company will develop a waterpower plant on the Columbia north of Kennewick and, coupling this with its Naches Valley power house, prepare to furnish light and power for all the towns in the valley.

Dr. Alexander Graham Bell will go to Nova Scotia during the present month to conduct some tests upon his tetrahedral flying machine. Though the new craft weighs only 342.5 pounds, it has a greater plane surface than the Wright ship. Dr. Bell says that one difficult problem of aviation in heavier-than-air machines will be a step nearer solution if his ship works well. That is, he will be able to fly at a speed of only 15 miles an hour, while the ships of the Wright model require a minimum speed of 26 miles to avoid sinking to earth.

Lieutenant Thomas E. Selfridge, who lost his life in an aeroplane accident, as mentioned in the Western Electrician last week, was buried at the Arlington National Cemetery with military honors on September 25th. The funeral was attended by more than a thousand persons, representing aeronautical organizations and the military service. The pallbearers were Maj. G. O. Squier, Lieut. R. B. Creecy, Lieut. G. C. Sweet, Dr. Alexander Graham Bell, Prof. Octave Chanute, J. A. D. McCurdy, Percy Bradford, Prof. Monroe Hopkins, F. W. Baldwin and W. J. Hammer.

Mr. George Hoxie Stickney, consulting illuminating engineer for the General Electric Company at Lynn, Mass., was married to Miss Minnie Mae Hasness of Jackson, Mich., at the home of the bride's parents on September 21st. Mr. and Mrs. Stickney left for an extended wedding trip to Texas to visit the mother and sister of the groom. They will be at home after October 25th at 51 Tudor Street, Lynn, Mass. Mr. Stickney, who is a Cornell graduate of the class of 1896, has an exceptionally wide acquaintance among electrical men all over the country. He is well liked and will be warmly congratulated.

Leslie Carter, former president of the Chicago South Side Elevated Railroad, and long a prominent figure in the business life of the city, died September 25th as a result of accidental gas poisoning almost a year ago. Since the accident he had been incapacitated and lay most of the time in a comatose state. Mr. Carter was 57 years of age, having been born in Galena, Ill., on August 28, 1851. After attending private school he went to Yale, where he won honors. He then went to the Columbia Law School and the Northwestern University Law School, later being admitted to the bar. He had been president of the Chicago Dock Company, the Calumet and Chicago Dock and Canal Company and the Rochelle and Southern Railroad Company, as well as a director in a great many corporations. As president of the South Side Elevated road for nine years Mr. Carter managed the company's affairs in a notable manner. During his administration it discarded steam for electricity, and just before Mr. Carter quit the executive office plans were laid for extensions, which, under the late Marcellus Hopkins, Mr. Carter's successor, materialized and gave the property added value.

Mr. Edson R. Wolcott, whose serial on "Alternating Currents and Their Applications" is begun in this issue of the Western Electrician, is well fitted, both by training and experience, to prepare a work of this character. A native of Sharon, Wis., he matriculated in the University of Wisconsin and graduated with the class of 1900, receiving special honors in electricity and winning the Science Club Medal with a thesis on "Wireless Telegraphy." Elected to a fellowship, he spent two years in instructional work at the same institution. Later, under the direction of Professors Warburg and Kohlrausch, he completed an investigation in electrochemistry at the University of Berlin, Germany, at the same time familiarizing himself with German methods of research and engineering. In 1903 he was appointed professor of physics in the Colorado School of Mines at Golden, Colo., where he established a course in electrometallurgy, devoting part of his time to practical work along electrical lines. In so doing he came in close contact with modern electrical practice through several of the large manufacturers, and during the last year he has devoted his entire attention to engineering work.


E. R. WOLCOTT

ELECTRIC LIGHTING

The Stigler (Okla.) Light and Power Company has been incorporated with a capital of $20,000.

An ordinance has been adopted by the council of the city of Bucyrus, Ohio, providing for the sale of bonds amounting to $90,000 for the purpose of erecting a municipal lighting plant. The bonds will be of $500 denominations and run to 1927.

The People's Light Company has been incorporated at Corpus Christi, Tex., with a capital stock of $30,000, by Clark Pease and others.

The City Council of Lima has killed the ordinance formerly passed to float $100,000 bonds for building a municipal lighting plant. It is probable that the city will now contract with the Schoepf syndicate for the city lighting.

The central station is the only plant running at Alliance, Ohio, because of the drought and the consequent shortage of water in the Mahoning River. Everything has been ordered closed down by the board of public works.

The city of Pasadena, Cal., is to enter into active competition with the Edison Electric Company in the lighting field. It is said that the city will start in commercial lighting with a profit from the start, enough customers having already been secured to make it pay. Later a solicitor will be employed.

The Commercial Club of El Reno, Okla., will have 15 electric arches installed on the city streets for illuminating and beautifying the downtown district. The arches will be 30 feet high and each will contain 44 lights. They will be built in the middle of each block through the shopping district and later extended down some of the residence streets.

The Western Electric Company, Chicago, is sending out circular letters inquiring if the addressee's lighting facilities are satisfactory and modern, and calling attention to the advantages of Western Electric arc lamps for general illumination. The letter is illustrated with examples of lamps and installations and is accompanied by a return card for the use of the inquirer.

The Central Electric Company of Chicago is distributing several publications on Columbia tungsten and Columbia tantalum-filament lamps, calling attention to the fact that Columbia incandescent lamps have been in the market for some 19 years with unqualified success. Accompanying these publications is a considerable amount of data, showing the watt consumption of the various lamps.

ELECTRIC RAILWAYS

An extensive system of electric street railway is to be constructed in the city of Saltillo, Mexico, by Schondube & Neugebauer of the City of Mexico.

The "pay-within" car put into operation by the Philadelphia Rapid Transit Company derives its name from the location of the conductor who stands within the body of the car to receive the fares instead of standing on the platform as in the familiar "pay-as-you-enter" type. The pay-within car has enabled existing types of cars to be changed over with less expense than the complete reconstruction required by the pay-as-you-enter car would entail. Fifty of the pay-within cars were put into operation in Philadelphia, September 27th.

A syndicate of St. Louis (Mo.) men, headed by William D. Boyce of the Boyce Construction Company, is promoting the construction of an extensive system of electric railway in Central Texas. The first division of the system will be between Temple and Waco by way of Marlin and will have a length of about 50 miles. The second division will run from Temple south to Austin, a distance of about 60 miles. It is planned to erect a power plant at Temple at a cost of about $200,000. This plant will be of ample size to afford power for the whole system, including a proposed extension from Austin to San Antonio, a further distance of about 80 miles.

In the efforts being made by the Chicago city authorities to compel the Oak Park Elevated line to elevate an outlying stretch of its road, the possibility of compelling a two-cent fare from Fifty-second Avenue to the downtown district has been discovered by the municipality lawyers. An ordinance passed by the old town of Cicero and accepted by the Lake Street Elevated provides that the elevated road shall accept transfers from the Lake Street surface line at Fifty-second Avenue, and under it the five-cent fare paid by the passenger would be divided equally between the two roads. Deducting a half cent per passenger for the Union Loop Company, the elevated road is left with a two-cent fare for the haul.

POWER TRANSMISSION

The Upper Valley Power Company has been incorporated at North Yakima, Wash.

The Horsford Power Company of Hickory, N. C., has amended its charter, changing its name to Western Carolina Power Company, and increasing the capital stock from $125,000 to $300,000. A. A. Shuford is president.

The Canyon Light, Power and Water Company has been incorporated at Wallace, Ida., with a capital stock of $250,000.

The Great Falls Power Company of Davidson County, Tenn., has amended its charter, increasing the capital stock from $20,000 to $625,000.

The W. F. Lyon Ice and Power Company of Kansas City has been incorporated with a capital of $150,000, and will put in an electric-light and power plant on the Blue River in that city.

Work is progressing on the new dam of the Folsom Power Company on South Silver Creek in El Dorado County, California. It is estimated that the new plant will give the company an additional 10,000 horsepower, which will mean much to the electrical supply of Sacramento.

The power plant of the Iron River (Wis.) Water, Light and Power Company was badly damaged by fire September 17th. Although the power house was constructed of concrete, with a frame roof covered with shee iron, much of the machinery was rendered worthless by the great heat caused by burning material. The loss exceeds the insurance carried, which was only $2,000.

At Long Beach, Cal., the Edison Electric Company has made application to the United States Engineer's office for permission to construct a power transmission line across the entrance channel to Long Beach harbor, alongside the rolling lift bridge now in process of construction by the Salt Lake Railroad Company. The wire will have a height of at least 140 feet above low water.

The new power plant of the Valley Power Company of Wenatchee will be ready by October 15th. The company expects to deliver power to Cashmere and other points along the line. Several pumping plants for irrigation will be operated by power from this source. The company expects to extend its line down the Columbia River to Malaga and other points where power will be needed for pumping projects.

PUBLICATIONS

Pass & Seymour, Solvay, N. Y., have issued a complete new price-list and discount sheet, dated September 9th, giving revised price-list on their entire line. They will be glad to send a copy to anyone in the trade on request.

Bulletins Nos. 5910-6 and 5910-7, issued by the Western Electric Company, Chicago, relate to the electrical equipment of hotels and department stores, respectively. Both bulletins are handsomely illustrated pamphlets, showing prominent installations of Western Electric apparatus as well as the devices adapted for this class of service.

Bulletin No. 1045 of the Allis-Chalmers Company describes the new rotary converter now being manufactured by that company. In the design of this machine special attention has been given to the proper ventilation of the armature and its lamination. Thus the iron loss and the heating have been reduced to a minimum and the efficiency and overload capacity decidedly improved.

Fort Wayne electric bulletins Nos. 1110 and 1111 concern standard multiphase switchboard panels and electric motor drives applied to machine tools. The first bulletin describes completely the elements of the panel carrying instruments, switches, ground detector, etc. Bulletin No. 1111 illustrates some interesting drives of machine tools and manufacturing machinery by direct and alternating-current motors.

The Central Laboratory Supply Company, Lafayette, Ind., has placed on the market an instrument which consists of an edgewise indicating instrument and a graphic curve-drawing instrument in one. These instruments are made for both alternating and direct currents, and in the form of ammeters, voltmeters and wattmeters and totalizing meters, the latter being an instrument which combines the outputs of all the generators in a plant, drawing the load curve of the entire plant on a single chart. These instruments are fully described in Catalogue No. 125, which will be sent upon request.

The Central Electric Company, Chicago, is distributing its 1909 general catalogue, which is a handsome volume of 1,024 pages. Unquestionably it has been the company's aim to make this catalogue the most complete electrical supply catalogue ever issued, and inspection of the book would indicate that this purpose has been accomplished. Considerable space is given to the specialties for which the company acts as sales agent—Columbia incandescent lamps, Pittsburg transformers, Okonite wires and cables, G-I arc lamps and New Lexington high-tension insulators. An extensive line of fixtures is shown, and this department of the catalogue gives some conception of the company's fixture department, which is said to be the most extensive in the West. The special announcement printed on the last page of the catalogue is also interesting as outlining in a general way some of the company's plans for expansion. The company is desirous of placing a copy of this catalogue in the hands of every individual who is actively engaged in plant operations, or who has anything to do with the specifying or purchasing of electrical material. Individuals who have not received a copy of this catalogue are urged to write for one.

A second edition of the handy bulletin on "Ignition" has been prepared by the Hoyt Electrical Instrument Works of Penacook, N. H. It is about twice as large as the first edition of this booklet. Aside from general knowledge on dry and storage batteries, spark coils and other ignition apparatus, a great many helpful suggestions on testing for ignition troubles are given and the use of the Hoyt volt-ammeter for this purpose fully described. Motorists and others using battery ignition for internal-combustion engines will find much of value in this publication, which can be obtained by writing to the company at the above address.

The Electric Storage Battery Company of Philadelphia has just issued the second section of a new series of sectional price-lists. This section covers the elements, jars and tanks of the Chloride accumulator for electric-railway, central lighting and power, isolated lighting, interlocking switch and signal, telephone, telegraph, fire-alarm, laboratory, small-motor work and miscellaneous service. This price-list will be known as Section A, and will be followed by other sections covering the many applications of the Chloride, Exide and Tudor accumulators. Copies will be forwarded upon application to any of the sales offices of the company. Section C, covering the Chloride accumulator and Tudor accumulator for car-lighting service, was issued in June.

SOCIETIES AND SCHOOLS

The next meeting of the American Association of Electric Motor Manufacturers, recently in fall session at Frontenac, Thousand Islands, N. Y., will be held about the middle of January.

Armour Institute of Technology branch of the American Institute of Electrical Engineers held a meeting on October 1st, at which G. P. Downton read a paper on "Booster Systems." At the meeting on October 15th Prof. G. E. Marsh will present a paper on "Electrons."

The first New York meeting of the season of the American Institute of Electrical Engineers will be held in the Engineers' Building, 29 West Thirty-ninth Street, New York city, on October 9th. There will be presented a paper on "High-potential Underground Transmission," by Messrs. Peter Junkersfeld and E. O. Schweitzer of the Commonwealth Edison Company, Chicago.

MISCELLANEOUS

The Wolback (Neb.) Telephone Company has been incorporated with a capital stock of $30,000.

The Canadian (Tex.) Long Distance Telephone Company has been incorporated with a capital stock of $10,000.

The wireless-telegraph operator at Honolulu, Hawaian Islands, has intercepted several messages between San Francisco and vessels at sea or other stations. A powerful sending apparatus is now being installed, and it is hoped that a more effective communication will soon be established.

Work has been suspended on the plant of the Continuous Waterpower Company at Alexandria, Ind., which proposed to manufacture a "continuous waterpower motor," the operation of which was akin to perpetual motion. The contractors say that the head of the company has failed to furnish the necessary funds with which to complete the work.

The Indianapolis factory of the Pope Motor Car Company, manufacturing Waverly electric automobiles, has been purchased by H. H. Rice and W. C. Johnson, who have been managers of the plant. The purchasers are said to represent a syndicate of Indianapolis capitalists, who take over the property, merchandise, patents, good-will and business of the plants.

The new telegraph company, known as The "Telepost," which will compete with the older telegraphic companies by introducing cheaper rates, announces that it has bought control of the Atlantic Telegraph Company, and is proposing to go into business heavily in New England. The new company states that its rapid automatic instruments will be installed at once. President Sellers of the Telepost company says: "Our Boston-Portland service will be an object lesson in the possibilities of 1,000-words-a-minute telegraphy at lower rates than the public has ever dreamed of. Mr. Delany's invention, which we control exclusively, introduces a new era in wire transmission, both in respect to speed and economy." A uniform rate will be made of 25 words for 25 cents between all points, irrespective of distance. The lines of the company touch Lowell, Lawrence and other Massachusetts cities, besides Dover and Portsmouth, N. H., and several important points in Maine. The company will start with five offices in Boston.

TRADE NEWS

Proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until October 30th, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States postoffice at Carthage, Mo., in accordance with drawings and specification, which may be obtained from the custodian of site at Carthage or at the office above referred to.

Dossert & Co., 242 West Forty-first Street, New York, have received an order for several hundred solderless lugs from the Trumbull Electric Manufacturing Company of Plainville, Conn., for use on the panel and switchboards to be installed in the new Senate office building at Washington, D. C. The lugs range in size from No. 6 B. & S. to 400,000 circular mils and many are of specially designed contact surfaces.

A large contract has been signed with the firm of Guinle & Cia., Brazilian agents for the General Electric Company, for the supply of electric energy to the Central Railway of Brazil, which is known as the largest enterprise of its kind in that country, for electrical equipment for all purposes, which will include the supply of energy as motive power as soon as the project now pending for the electrification of a section of that railroad is decided upon. To this firm was also granted a federal concession covering the supply of light and power to the city of Sao Paulo, which has 300,000 inhabitants, and is known as the largest coffee market in the world.

BUSINESS

The Central Electric Company, Chicago, has announced a second general reduction in the list prices of tungsten lamps, this reduction taking place October 1, 1908, and the prices being subject to the latest discounts announced a short time ago. These new prices bring the net prices of tungsten lamps to a point which will greatly increase the sales, and in anticipation of this demand, the Central Electric Company has accumulated and will maintain at least 10,000 Columbia tungsten lamps in Chicago stock for immediate delivery.

Orders placed by traction companies throughout the country with the Allis-Chalmers Company, Milwaukee, for new equipment or improvements to existing apparatus, will be found an indication of more than ordinary significance, when coupled with reports of returning activity in nearly all manufacturing lines. The Omaha and Council Bluffs Street Railway Company recently placed an order for 14 straight-airbrake equipments, the second this year, with the Allis-Chalmers Company. The compressors furnished are compact and self-contained and, on account of their simplicity, are easily accessible. The Denison and Sherman (Tex.) Traction Company recently changed the brake equipments on all of its cars to straight air with 20-inch compressors of the same company's manufacture. The Northwestren Elevated Railroad Company of Chicago has awarded a contract for Allis-Chalmers type C-5 air compressors and governors for 20 new cars now being built at the Pullman shops. The Allis-Chalmers Company has also completed brake equipments on cars for the Niagara Gorge Scenic Railway, Niagara Falls, N. Y., and has additional orders for railway motors, controllers, compressors, governors or complete airbrake equipments from a great many railway and car-building companies.

DATES AHEAD

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

Illuminating Engineering Society (annual convention), Philadelphia, October 6th and 7th.

Kansas Gas, Water, Electric Light and Street Railway Association (annual meeting), Pittsburg, Kan., October 8th and 9th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

Sons of Jove (annual meeting), Buffalo, N. Y., October 15th and 16th.

Western Association of Electrical Inspectors, annual meeting, Chicago, October 20th to 22d.

Illinois State Electric Association (annual convention), Illinois Hotel, Bloomington, October 27th and 28th.

American Electrochemical Society (fall meeting), New York city, October 30th and 31st.

Association of Car Lighting Engineers (first annual convention), Chicago, November 16th to 21st.

Chicago Electrical Show (fourth annual), Coliseum, January 11th to 23d, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) September 22, 1908

899,024. Party-line Indicating Key. Clifford C. Bradbury, Chicago, Ill., assignor to the Kellogg Switchboard and Supply Company, Chicago, Ill. Application filed August 3, 1907.

A number of reciprocating switch actuating buttons are supported by a frame, each button being adapted to rotate to an indicating position after it has been depressed and released.

899,043. Recording Instrument. Jesse Harris, Lafayette, Ind., assignor to the Central Laboratory Supply Company, Lafayette, Ind. Application filed June 14, 1907.

Connected with the pen and ink-holding tube is a magnet and its armature.

899,059. Insulator for Armature Conductors. Albert R. Locke, Chicago, Ill. Application filed December 20, 1907.

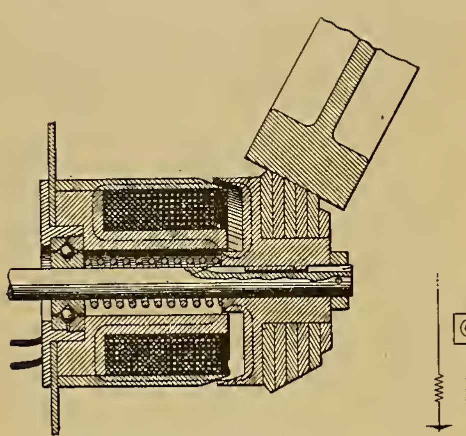
A hood for covering electric joints in armature construction comprises an integral unbroken molded structure of insulating material open only at one side and end.

899,068. Apparatus for Detecting Inflammable Gases in Air. Arnold Philip and Louis J. Steele, Portsmouth, England. Application filed September 9, 1907.

The apparatus contains a catalytic agent over which the gases and air are passed. This is adapted to act on an electric circuit containing indicating lamps.

899,088. Governor for Dynamos. Charles L. Weichelt, Philadelphia, Pa. Application filed December 11, 1907.

Around the armature shaft is a stationary electromagnet connected to the field circuit. The armature



No. 899,088.—SPEED GOVERNOR FOR DYNAMOS

of this magnet slides axially against the force of a spring and carries a friction pulley. (See cut.)

899,120. Rail Bond. George A. Mead, Mansfield, Ohio. Application filed March 20, 1906.

This rail bond consists of a body portion having integral terminals, and a separate protector secured to the bond at a point adjacent the terminals.

899,127. Means for Protecting High-tension Overhead Electric Conductors. Lucien Neu, Lille, France. Application filed April 3, 1906.

Inductive coils are introduced at each end of the line to be protected. A shunt between these ends includes condensers and a source of high-frequency current controlling a relay.

899,134. Electric Signaling System for Railways. Ara P. Rickmire, Waterloo, Iowa. Application filed December 30, 1907.

Circuits are arranged which actuate an electric bell on the locomotive or car in case of danger.

899,145. Electrical System of Distribution. William A. Turbayne, Lancaster, N. Y., assignor to the Gould Storage Battery Company. Application filed February 25, 1907.

The system comprises a main generator, two circuits fed thereby, a supplementary generator in series in each circuit, and means for oppositely varying the electromotive forces of these generators responsively to changes in current strength.

899,175. Speculum. William Meyer, Chicago, Ill. Application filed March 11, 1908.

There is a cylindrical, hollow body portion, a casing arranged longitudinally of and entirely within this and an electric lamp and its connections snugly fitting in the casing and filling the same.

899,181. Electric Gas Lighter. James D. McIntyre, Newman, Ill. Application filed March 4, 1907.

The movable contact is arranged to slide within the stationary one.

899,189. Electromotor Controlling and Operating System for Electric Railways and Power Plants. Johann Sahulka, Vienna, Austria-Hungary. Application filed June 1, 1907.

This system is provided with a main motor, a supplementary motor and a regulating dynamo.

899,193. Automatic Electrical Measuring Apparatus. Daniel J. Shine, Las Vegas, Nev. Application filed March 4, 1907.

A Wheatstone bridge is provided with resistance arms on which moves an electromagnetically controlled contact.

899,205. Electric Switch. Charles A. Clark, Hartford, Conn. Application filed May 24, 1907.

A push-button snap-switch is described.

899,209. Automatic Telegraphy. Patrick B. Delany, South Orange, N. J., assignor to the Telepost Company of Maine. Application filed December 15, 1896.

The apparatus consists of a chemical receiver, a tape automatic transmitter of currents of reverse polarity, electromagnetic transmitter-arresting devices and means located at the receiver whereby the receiving operator may at will actuate the arresting means.

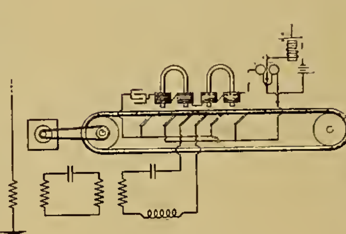
899,225. Respiration Apparatus. Peter Lord, Worcester, Mass.; Martha V. Lord, administratrix of said Peter Lord, deceased. Application filed July 10, 1905.

The patient is put into a closed compartment which is provided with a motor-driven force pump and a similar suction pump.

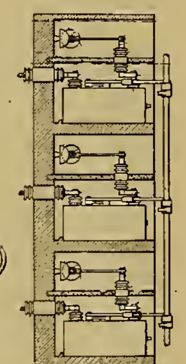
899,226. Electroplating Apparatus. George A. Lutz, Plainfield, N. J., assignor to the American Circular Loom Company, Portland, Me. Application filed June 6, 1908.

An electroplating anode comprises a perforated insulating tube, a closure at the lower end thereof, a support for the tube passing upwardly therein, and plating-metal particles within the tube.

899,228. Safety Apparatus for Cars. Theodore A. Mayer, Washington, D. C. Application filed March 17, 1908.



No. 899,243.—OSCILLATION DETECTOR



No. 899,358.—SWITCH COMPARTMENTS

On the controller is an electromagnet which locks the handle so as to prevent starting of the car as long as anyone stands on the car step.

899,234. Massaging Instrument. Julius B. Wantz, Chicago, Ill., assignor to the Victor Electric Company, Chicago, Ill. Application filed October 23, 1907.

An electric motor operates the vibrator.

899,239 to 899,242. Signaling System. Sewall Cabot, Brookline, Mass., assignor to the Stone Telegraph and Telephone Company, Boston, Mass. Applications filed March 10, 1906.

These four patents relate to a wireless-telegraph system operating in conjunction with a wire-telegraph system. A relay station is provided where the two systems join. In the last patent the scheme is extended to similar multiplex systems.

899,243. Space Telegraphy. Sewall Cabot, Brookline, Mass., assignor to the Stone Telegraph and Telephone Company, Boston, Mass. Application filed April 4, 1906.

A detector for high-frequency oscillations consists of a closed electric circuit which is moved relatively to a magnetic field. (See cut.)

899,264. Oscillation Detector. Charles E. Russell, Cambridge, Mass., assignor to the Stone Telegraph and Telephone Company, Boston, Mass. Application filed September 4, 1906.

Connected with a permanent magnet is an iron core on which the oscillation-circuit coil is mounted.

899,272. Apparatus for Determining the Direction of Space-telegraph Signals. John S. Stone, Cambridge, Mass., assignor to William W. Swan, trustee, Brookline, Mass. Application filed August 17, 1906.

The elevated receiving-conductors are connected by a conductor divided into unequal parts.

899,278. Telephone Switchboard. Charles E. Wilson, Philadelphia, Pa., assignor to the Keystone Telephone Company of Philadelphia, Philadelphia, Pa. Application filed September 10, 1904.

Above the rows of answering jacks is a similar group of multiple jacks and above this a corresponding set of manually operated call-registering devices.

899,307. Telegraph Sounder. Lee Kiblinger, Jackson, La. Application filed November 18, 1907.

The electromagnets have wide flat pole pieces for the purpose of equalizing the magnetic field between the armature and poles.

899,321. Advertising Apparatus. Jean Reix, Paris, France. Application filed November 25, 1905.

Two parallel current-carrying wires form an aerial track along which a suspended motor carriage draws a series of electrically illuminated letters.

899,348. Magnetic Ore Separator. Charles E. Stebbins, Iola, Kan. Application filed April 17, 1908.

At the base of a shaft is mounted a set of electromagnets, the connections of which are controlled by a corresponding set of brushes and a commutator.

899,353. Alternating-current Block-signaling System. Jacob B. Struble, Swissvale, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Application filed April 1, 1908.

Home and distant signals are controlled by relays that are governed by track circuits.

899,358. Arrangement of Protective Apparatus. Hermon L. Van Valkenburg, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed September 29, 1906.

A multipolar switch is located in a fireproof enclosure therefor, each pole of the switch being in a separate compartment. A number of bus-bars pass through the enclosure, each bus being located adjacent one pole of the switch. (See cut.)

899,362. Safety Elevator. Hugh Watson, Washington, D. C. Application filed December 27, 1907.

Each door in the shaft is provided with an electrically operated clutch for connecting to a door-opening mechanism.

899,364. Electric Separator. Henry A. Wentworth, Lynn, Mass., assignor to the Huff Electrostatic Separator Company, Boston, Mass. Application filed February 3, 1908.

This separator is a combination of electrodes and means to supply electric charge thereto in intermittent unidirectional impulses.

899,370. Dynamo-electric Machine of the Enclosed Type. Alfred H. Wouters, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed March 18, 1907.

About the shaft is a housing with an air-receiving chamber and an air-admission chamber.

899,379. Party-line Indicating Key. Clifford C. Bradbury, Chicago, Ill., assignor to the Kellogg Switchboard and Supply Company, Chicago, Ill. Application filed March 11, 1907.

A self-indicating operator's key consists of a number of levers, switch springs actuated by the tilting of the levers, and means for causing the levers themselves to indicate the last set of springs actuated and released.

899,447. Dynamo-electric Machine. Allan B. Field, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed November 30, 1906.

The field poles are made of a laminated core, bolted between end plates and a damping or anti-hunting device, which is a low resistance copper ring surrounding the pole and to which are attached a number of rods embedded in the laminæ at right angles to them.

899,474. Trolley Wheel. Joseph W. Seibert, Washington, Pa., assignor of one-half to Elias Lewis, Washington, Pa. Application filed February 5, 1908.

In the harp is mounted a shaft on which is a wheel with an eccentric opening and a pair of guide members with openings to register with the opening in the wheel.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired September 29, 1908:

460,109. Telegraphic Transmitting Instrument. C. G. Burke, Richmond Hill, N. Y.

460,110 and 460,111. Telegraphic Instrument. C. G. Burke, Richmond Hill, N. Y.

460,122. Process of and Apparatus for Generating Electricity. T. A. Edison, Menlo Park, N. J.

460,125. Dynamo-electric Motor. Wm. M. Fink, Elizabeth, N. J.

460,235. Electrode for Secondary Batteries. J. B. McDonald, Chicago, Ill.

460,245. Switch for Series Dynamo-electric Machines. C. R. Arnold, Sharon Hill, Pa.

460,287. Electric Alarm. C. H. Shaffer, Rockford, Ill.

460,328. Printing Telegraph. J. E. Wright, New York, N. Y.

460,349. Printing-telegraph Apparatus. G. A. Cassagnes, Paris, France.

460,364. System of Electrical Distribution. E. W. Rice, Jr., Lynn, Mass.

460,428. Method of Soldering or Brazing by Electricity. C. L. Coffin, Detroit, Mich.

460,457. Printing-telegraph Instrument. J. E. Wright, New York, N. Y.

460,464. Automatic Electric Fire-alarm System. W. S. Cook, M. C. Cook and A. H. Morrow, South Omaha, Neb.

460,514. Electric Crane. Wm. A. Stadelman, Philadelphia, Pa.

460,524. Electrical-railway Signaling Apparatus. W. F. Z. Desant, New York, N. Y.

460,525. Electric-railway Signal. W. F. Z. Desant, New York, N. Y.

460,541. Electric Elevator. R. C. Smith, Yonkers, N. Y.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, OCTOBER 10, 1908. No. 15

A UNIQUE WIRE-ROPE TRAMWAY

By Dr. Alfred Gradenwitz

The numerous wire-rope railways leading to mountain summits or other spots commanding an extensive view are usually operated on the following principle:

Two cars are fixed to the two ends of a cable wound over a drum that is installed at the summit of an inclined plane, one of the cars rising during the descent of the other, and vice versa. This motion being alternative, the number of passengers transported during a given time is necessarily limited, depending on the number of seats and the length of the line.

If the volume of traffic is approximately constant throughout the day the number of seats is readily determined so as to utilize the available material advantageously. But if some isolated site or hotel is to be served, to which excursions are made only on certain days and at certain hours, this system of wire-rope railway is obviously at a disadvantage.

In order to obviate these drawbacks a French engineer, Mr. G. E. Bernardet, in connection with a wire-rope tramway recently installed in the neighborhood of Nancy, France, has designed quite a novel system, substituting for the alternate motion a continuous operation, which is readily adapted to the variable requirements of traffic.

The principle underlying the construction of this system of railway is to some extent analogous to that of a bucket dredge, the buckets being replaced by small cars or trucks for conveying passengers.

An endless cable is wound over two drums of equal diameter, one of which, the driving drum, is located on the summit of the inclined plane, while the other is situated at the bottom on a movable track running on two rails, and insures the tension of the cable by means of a suitable counterweight. The traction cable is double, being made up of two twin steel cables, either of which suffices to deal with maximum strains with only one-tenth of its breaking strength, while the other one constitutes a safety cable. These cables, which are placed above each other, are connected at intervals of 1.5 meters by clamps comprising two parts bolted together. These clamps insure the winding motion of the cable over the driving drum (provided with notches) as well as the attachment of the small cars. Every other clamp rests on a central guiding rail by an idler, and these idler clamps are exclusively used to attach the cars while the others only serve for the conveyance of the cable.

The deflection of the cables is therefore reduced to a minimum, both being constantly kept parallel to the track rails. Torsion of the cables is likewise prevented and the height at which the cars are attached is constant throughout the length of the line. As the cables are kept in position by idlers placed on the tension drum three meters apart, the strain only corresponds to the strain required to tighten a cable three meters in length. This is why a counterpoise of 1,200 kilograms, able to exert a force of 300 kilograms on each cable, fully suffices to insure this tension.

AN ELECTRIC WIRE-ROPE TRAMWAY OF UNUSUAL DESIGN

The distance to be covered between stations is 229 meters and the level difference is 48 meters. The two tracks on which the cars travel are located 1.95 meters apart between centers and are made up of rails of a weight of nine kilograms per meter, resting at distances of two meters each on substantial oak ties. Between the rails of each track circulates the endless steel cable, which is made up of two twin cables, 24 millimeters in diameter.

The small cars are distributed throughout the length of the cable like the buckets of a dredge; they ascend with the cable, and after reaching their destination are detached automatically in order to be conveyed on an electrically operated traveling platform situated at right angles to the rails and which serves to convey them onto the other or downward track. When the passengers enter the cars the operator actuates the traction grip by simply acting on a handle when the cars start on their course immediately.

Each car accommodates six passengers, is 1.8 meters in length and 1.4 meters in width, resting on two axles 80 centimeters apart. Access to the cars is obtained from the platform, which is at the same level.

Each car is fully provided with safety apparatus, allowing it to be stopped on the track in the case of accidents. By actuating this apparatus the axles are arrested and the rotation of the four wheels is stopped, while from both sides of the car two substantial wrought-iron struts are dropped on the rails, striking against iron stops provided for the purpose.

Electric power is used to operate this tramway, current being supplied by the Nancy Electric Company. A gearwheel 1.95 meters in diameter which is coupled to the driving drum is operated by a motor of 29 horsepower through two sets of gearing and a bevel pinion. The motor is of the four-pole type and is actuated by direct current at 440 volts, being shunt-excited at the same potential and rotating at a uniform speed independently of any variations in the load. A field rheostat allows the exciting current to be controlled, thus varying the speed and torque.

Whenever the passenger traffic on the descent is heavier than on the ascending track the tramway will be worked by gravity and the motor will act as a generator, throwing its current into the conductors and serving the purpose of an automatic regulating brake.

Current required for the working of the traveling platforms (which are constituted by endless aprons made up of several steel plates) is supplied by a special motor.

Although cheap in first cost, this system of wire-rope tramway has been found advantageous in operation, the traffic served being continuously on the increase.

ILLINOIS CENTRAL ELECTRIFICATION

The public agitation in Chicago for the electrification of the terminals of the Illinois Central Railroad in the city has not abated in the least. The City Council at its first meeting since the summer vacation ordered a committee to urge the passage of a bill by the State Legislature compelling all steam-railway lines operating suburban passenger trains within the city limits to operate them by electricity only. Such a law if passed would affect seven other railroads in the city besides the Illinois Central. The latter road has adopted a conciliatory attitude and promises of "something definite" are to be announced after a conference of city and railroad officials to be held on October 12th

NEW "WIRELESS" PLANT FOR EIFFEL TOWER

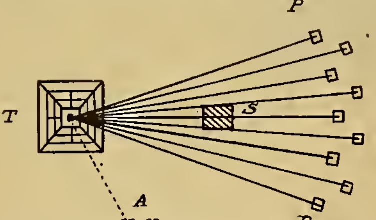
The accompanying illustration (Fig. 1) is from one of the first photographs taken of the work of construction of the new high-power wireless station of the Eiffel Tower. It shows the first steps in

FIG. 1. NEW "WIRELESS" PLANT FOR EIFFEL TOWER, SHOWING STONE ANCHOR PILLARS FOR AERIAL WIRES

erecting a plant from which we are likely to have some sensational performances in the future, since the great height of the tower (nearly 1,000 feet) affords a mast which is by far the tallest in the world. Only the limited power of the present wireless apparatus prevented very long distances from being covered with the existing plant.

Having heard that ground had been broken for the plant, although the French journals had not mentioned the matter, the Paris correspondent of the Western Electrician made a visit to the Champ de Mars, on which the tower is located, and was somewhat surprised to find that the work was well under way. A few hundred feet from the base of the tower the workmen were engaged in making the rectangular excavation to contain the underground power plant. The work of placing the stone foundations for anchoring the mast wires is now nearly finished. The photograph shows the ornamental appearance of these anchor-pillars; and their arrangement, spaced across the width of the park and at a considerable distance from the base of the tower, is shown in the plat, Fig. 2. Between the rows of pillars and the tower is the site of the underground station.

The mast wires will be fixed at a point near the top of the tower, and at ground each wire is to be anchored in its respective pillar. For greater rigidity this wire structure will be cross-braced by tie wires. The antennæ will be made up of 10 main wires, all strung on the opposite side of the tower from the Seine. It would not be practicable to bring the wires down on all sides, since the Champ de Mars is not very wide compared with the height of the tower, and the river bank is very close on the Seine side. From the middle of



T, Tower; S, Underground Station; PP, Pillars; A, Old Plant

FIG. 2. EIFFEL TOWER WIRELESS PLANT—PLAN VIEW

the antennæ a connecting wire will be dropped to the underground station. The two main reasons for placing the wireless plant underground were the objections to marring the landscape of the Champ de Mars, which has been cleared of the debris remaining from the exposition of 1900 and is now laid out as an ornamental park; and the muffling of the noise from the heavy sparks employed in the transmitting apparatus. As the post is designed specially for military use, it would be imprudent to allow these sparks to be heard, since one familiar with telegraph characters could interpret them easily.

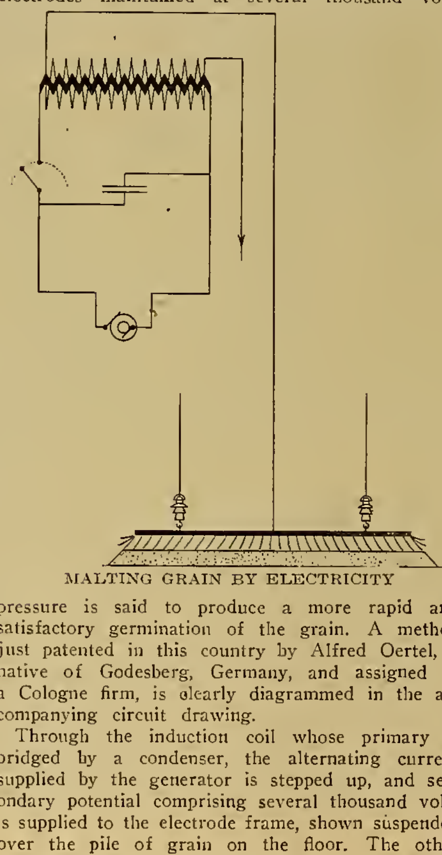
Owing to the novel magnitude of the present enterprise, it will of course be impossible to say in advance what will be the range of the new equipment. As the present temporary plant is already taking measures for signaling to New York, using only 25 horsepower, it seems that the new plant should send messages across the Atlantic easily. Should twice this distance be covered it would not be surprising, but of course only surmises can be made at present. At all events, the results obtained by the plant will no doubt mark a date in the history of wireless telegraphy.

As in the case of the present station, the new one will be in charge of Captain Ferrié, who is at the head of military wireless operations at Paris and is the inventor of several improvements in "wireless." The tower plant is now using Captain Ferrié's system, and messages are received from the coast of Africa, proving of great value in the military operations which are now being carried out in Morocco.

When the new tower station is finished we may see some very striking experiments carried out in wireless telephony. When telephoning across the Atlantic becomes possible, as inventors hope, the new tower station will no doubt receive the first messages.

MALTING GRAIN BY ELECTRICITY

The use of high-tension alternating currents has been found to aid in the malting processes of certain grains, for the discharge of electricity from electrodes maintained at several thousand volts



MALTING GRAIN BY ELECTRICITY

pressure is said to produce a more rapid and satisfactory germination of the grain. A method just patented in this country by Alfred Oertel, a native of Godesberg, Germany, and assigned to a Cologne firm, is clearly diagrammed in the accompanying circuit drawing.

Through the induction coil whose primary is bridged by a condenser, the alternating current supplied by the generator is stepped up, and secondary potential comprising several thousand volts is supplied to the electrode frame, shown suspended over the pile of grain on the floor. The other high-tension electrode is grounded to the floor. The electrode is of sheet metal, wire net or metallic lattice work and is suspended by insulators.

The grain to be malted is first moistened before being spread upon the floor. The electrode is then lowered until it is within a few inches of the grain and the switch closed. Immediately a high difference of potential occurs between the grain and the electrode, causing sparks to pass between them. The electrode is then raised until sparks cease to pass between it and the grain. When the sparks cease, there occurs an invisible discharge of current between all parts of the electrode and grain, in the form of brushes of dark rays, which produce the desired effect in securing a more rapid and satisfactory germination of the grain. When the grain is to be turned or stirred, the switch is opened and the electrode drawn up. It is to be noted that during the operation the distance between the electrode and the surface of the grain is such that no sparks can pass between them.

This process may also be advantageously used in the steeping process by subjecting the grain in the steeping vats to the dark rays, as described. In this case the ozone which is produced produces an additional though incidental advantage, as, by dissolving in the liquid of the steeping bath, it materially improves it for the purpose.

HIGH-PRESSURE FIRE SERVICE IN NEW YORK CITY

There are not wanting those who declare that the knell of the fire engine, with its accompanying inefficiency and expense, has been sounded, and that an era of more efficient fire protection for cities is at hand.

A test of the 10 new motor-driven centrifugal pumps recently installed for the Manhattan high-pressure fire service, demonstrated to the satisfaction of the New York Fire Department that the mere use of hydrants and hose, supplied with water at high pressure from the new central pumping stations, far exceeds in efficiency the best service obtainable from portable steam fire engines. Moreover, the hydrants were only only opened to half their capacity.

Twenty lines of three-inch rubber hose, three to each hydrant, and varying in length up to nearly an eighth of a mile, were trained on an imaginary fire and each held in place by three firemen, with the assistance of mechanical supporters, although the pressure was maintained so steady that one man to each hose line would have sufficed. The importance of this, from considerations of economy and the increased ability of the force to fight large fires, will be appreciated.

When all was ready the fire valves in the mains were opened, the hydrants turned, and a single pump forced water at 300 pounds per square inch pressure into the hose, other pumps being started in rapid rotation until five were in service, forcing through the hydrants a volume of water that reached the great total of 18,000 gallons a minute, or at the rate of 26,000,000 gallons in 24 hours. Instruments attached to each feeding hydrant and nozzle indicated the strength of the stream.

In the first test water was turned on for 20 minutes, and streams sent in an upward direction parallel to the skyscrapers in the vicinity. One of these, the Western Electric Building, is 12 stories high, but at full pressure water from several of the lines reached to its roof, and later a stream washed the flagpole on top of the 17-story Metropolis Building, at Sixteenth Street and Broadway. While this is the greatest height to which water has ever been thrown, it does not, according to Chief Croker, mark the limit of the new pressure system.

At the end of the period mentioned the supply of water was suddenly shut off; the nozzles were unclamped and the lines "siamesed," i. e., two lines run into a single hydrant mouth, 10 of these extensions being made. The remainder of the flow was diverted to a water-tower and extension reared 60 feet in the air. When the signal was given the water came gushing through all the outlets at great speed. The plug indicators in a few minutes jumped to 300 pounds, while the greatest power at the nozzles was taken at 175 pounds on the two-inch pipes and 195 on the inch and a half. The water-tower needle held at 175. When the water was several inches deep in the streets and the flow was running toward the docks, Chief Croker called an end to the test.

The lengths used in the test are the same as those which would be employed under actual fire conditions. The discharge was several times greater than would be used at even a very large fire.

The arrangement of the high-pressure system is such as to allow the engineers at the pumping station to concentrate or spread the supply of water and increase the pressure, within its maximum limit, at the command of the firemen. "This added power," said Chief Croker after the test, "precludes the possibility of any large conflagration in this city. With a concentration of pressure such as we had today, we can control any blaze in a short time."

It was the general judgment of the authorities present that the pumping stations and fire mains will eventually supplant fire engines throughout the city. The disadvantages of the engine are manifest. The time lost in getting up steam and in running to fires, the chance of blockades and other delays are all dangerous. With the required pressure almost instantly available at any point where fires break out, the flames can be quickly brought under control, if not speedily extinguished, and a lowering of insurance rates in districts having this protection is only one of the natural consequences. That item alone will save the people of New York and other cities installing the system an amount sufficient to cover both its first cost and annual maintenance many times over.

The new high-pressure service of New York city is intended primarily to afford protection to what is known as the "dry-goods district," extending north from the City Hall to Twenty-fifth Street, and east from North River to Second Avenue and East Broadway. There the buildings are "sky-scrapers" and the need for high pressure to reach them is obvious. The system, as installed, comprises about 63 miles of extra heavy cast-iron mains from 12 to 24 inches in diameter, and two pumping stations with a present combined capacity of 30,000 gallons per minute, delivered at a pressure of 300 pounds per square inch.

The new system is known as the Salt-water System; it is, however, a fresh-water system except in the emergency of the Croton water supply running dry. The stations draw water from the Croton mains and pump it into the new high-pressure mains as long as the supply lasts. If it fails, then the pumps will draw salt water from the rivers and pump this water into the high-pressure mains. The change from one to the other can be made without a moment's delay. The high-pressure system has special hydrants fitted to the special mains, which are entirely distinct from the present Croton water mains.

Both pumping stations are outside of the district of high fire risk, one being near the Gansevoort Market on the North River, and the other on the corner of Olive and South streets, near the East River. The buildings are of brick and steel fireproof construction, with concrete foundation. Each station contains five pumping units, comprising Allis-Chalmers multi-stage centrifugal pumps, each driven by an Allis-Chalmers induction motor. The stations are identical in construction and equipment and for the present each is laid out to accommodate eight pumping units, five of which are now installed.

The Gansevoort Street building, which is typical of both, is one story high, with basement. The pumps have been placed along both sides of the building, on the main floor. They are of the horizontal centrifugal type, each having six stages, delivering 3,000 gallons per minute against a discharge pressure of 300 pounds per square inch when operating at about 740 revolutions per minute. The internal parts are all made of bronze composition; the casing also is lined with brass, so that all parts in contact with water are non-corrosive.

Though the pumps are water balanced, special provision is made for end thrust by a ball bearing with two rings of 1½-inch balls in the outboard bearing. The bearings are of the ring-oiled type and are separated from the pump casing by packing glands which prevent foreign matter from entering the bearings. All parts of the runners and diffusion vanes are thoroughly lubricated by oil cups on the base of the pumps. A special feature is the wide base which brings the pump barrel as low as possible and gives stability.

Each pump is direct-connected to its motor by a special flexible coupling. The motors are of the constant-speed, induction type, three-phase, 25-cycle, 6,300 to 6,600-volt, designed to operate at about 740 revolutions per minute. Their full-load efficiency is approximately 93 per cent.; the full-load power factor is approximately 94 per cent., and the slip at full load is approximately one per cent. The motors are of the wound-rotor type, and in starting, an iron grid resistance is connected in the secondary circuit and gradually cut out by means of a hand-wheel installed on the motor-switchboard panel. When the resistance is all cut out the rotor is automatically short-circuited by means of specially constructed solenoids, which are controlled and operated by means of a small control switch mounted directly on the shaft of the hand-wheel above referred to. These motors are so designed that they can be brought up from standstill to full speed in less than 30 seconds. An interlocking arrangement is provided with the controller device, arranged in such a manner that the operator cannot close the switch connecting the motor to the line while the rotor is short-circuited.

Each combined unit is equipped with automatic and hand control. The pumps can be kept primed constantly ready for almost instantaneous service and, by means of pressure regulators and relief valves, the discharge can be maintained at any desired pressure between 100 and 300 pounds per square inch. The current for operating both of these stations is to be supplied by the New York Edison Company. Each station has special three-phase cables laid in ducts running from the main generating station.

There are always hydrants within 400 feet of any building in the district, and there are enough hydrants, so that 60 streams of 500 gallons per minute can be concentrated on a block with a length of hose not exceeding 400 to 500 feet. To save time in sending in orders to the engineer at the stations, concerning the pressure and amount of water required, a system of telephone boxes is being installed, so placed that a fire in any part of the district can be watched from at least one of these signal stations.

In order that there may be no delay occasioned by priming the pumps when they are to handle salt water, three vacuum pumps are provided, each of which, when working singly, can prime the sections and maintain constantly for the eight pumps a vacuum of at least 26 inches of mercury. Each pump is geared to a direct-current motor, the unit in each case being self-contained. Two of these motors are of the same size; the third is larger.

Connected to the highest point of each salt-water suction line is a cylindrical air chamber, with a capacity of about 130 cubic feet, in which the entrained air and gases in the water will be collected so that the suction to the main pumps can be maintained at all times. The priming apparatus is so designed that any one or all three of the air pumps can be operated in connection with either of the air chambers. By an automatic device one of the smaller pumps will be set in motion when the water in the air chamber falls below a predetermined level; similarly, the large vacuum pump will be put in operation automatically when the water falls below a second predetermined level, indicating that the smaller pump cannot maintain the required vacuum. The second small vacuum pump will be held in reserve for use in special emergencies. The main pumps can also be primed with fresh water taken from the city water distribution system through a 12-inch pipe.

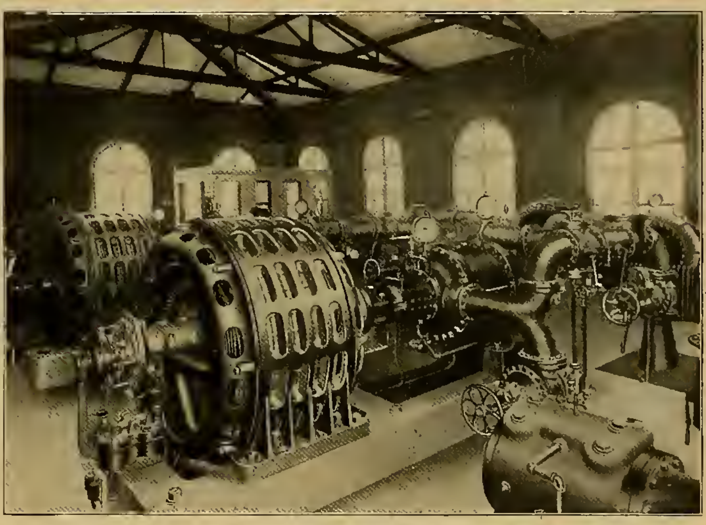
The fresh-water supply for the Gansevoort station is taken from a number of large mains of the city-water supply system, varying in size from 20 to 48 inches, cross-connected by a 36-inch main from which two 24-inch suction lines extend longitudinally under the pumps at each side of the building. These pipes are cross-connected at each end of the basement with a 20-inch pipe equipped with a motor-operated gate valve. A 24-inch motor-operated gate valve is placed just outside the suction loop on each of the five supply pipes and 24-inch manually operated gate valves are arranged on both suction and discharge mains. The 24-inch discharge main forms a loop, the ends of which leave the building at the north end, where a 24-inch motor-operated valve and a Venturi meter with a recording instrument are introduced in each line.

The suction of each pump is connected to the suction main by a 24-inch pipe, which gradually reduces to 10 inches at the pump, where a gate valve is introduced. Each pump discharges through a 10-inch check valve and a motor-operated gate valve into a pipe which increases to 20 inches at its connection with the main discharge line. The valves are introduced to facilitate the isolation of the pumps from the system and prevent back flow from the delivery pipe into the suction main.

All the discharge mains are designed very substantially to withstand a regular working pressure of 300 pounds per square inch. The joints are of special form, and there are deep double grooves in both the spigot and the hub ends. The special castings for the large three-way and four-way branches are made of steel, with a very large factor of safety. The other specials are cast-iron and are also designed with a large factor of safety. The gates are of cast-iron, have nickel-steel stems, and all other working and bearing parts are of bronze.

The New York high-pressure system was designed by I. M. de Varona, chief engineer of the Department of Water Supply, Gas and Electricity, who also designed the high-pressure fire system for Brooklyn and Coney Island, and under whose supervision the construction work is carried on. The complete equipment of the pumping stations was built and installed by the Allis-Chalmers Company of Milwaukee.

TEST OF HIGH-PRESSURE FIRE SERVICE IN NEW YORK CITY



INTERIOR OF ONE OF THE NEW ELECTRIC FIRE PUMPING STATIONS IN NEW YORK

THE PARIS TELEPHONE FIRE

A financial loss of from $6,000,000 to $8,000,000 and the deprivation of service to nearly 20,000 telephone subscribers were the results of the disastrous fire which occurred at the Gutenberg or main telephone exchange of Paris on the night of September 20th. Practically the whole building was burned, including the different multiple boards, cables, etc., and but little of the apparatus can be saved for future use. Nearly all of the multiple boards which the building contained on its different floors were entirely destroyed by the fire. The building as a whole was left standing, but as it is a wreck a new exchange office will need to be erected. The loss of the telephone service in the heart of the city proved a great annoyance to business in general as may be imagined.

It appears that the fire started in the basement floor, where the cables coming from the underground system were located. At 7 o'clock the basement was full of smoke and the flames soon broke out and reached the third story, following the cable shafts. The employes fled panic-stricken from the building, having opened most of the main switches beforehand. The fire occurred on Sunday, when only a few employes were on duty and no accidents of any kind are reported.

The 18,000 telephones connected with the Gutenberg exchange were cut off completely, among them being the most important subscribers such as the government offices, newspapers and leading business houses. When the firemen arrived dense clouds of smoke were pouring from the building and soon the flames appeared from the windows of the third story. The firemen had a hard time to fight the fire owing to the combustible nature of the material. As the telephone exchange is separated by only a short distance from the central postoffice building, for a time it was feared that the fire would spread to the latter. In the third story of the exchange was a storage battery weighing 20 tons, and it was feared that it would fall through the building.

As the fire spread from floor to floor the main multiple boards were soon attacked and the great amount of cables and wiring rapidly consumed. At midnight the fire was practically extinguished. The next morning the building was visited by M. Barthou, minister of public works; M. Semijan, secretary of posts and telegraphs, and other leading officials to determine the extent of the disaster. Nearly everything in the exchange was a loss. On the ground floor only a mass of burned and twisted wires imbedded in mud and debris remained. The second floor contained the long-distance switchboard, which was one of the least damaged, and perhaps can be repaired. On the third and fourth floors the multiple boards were entirely wrecked and will need to be replaced. The fifth floor contained the new central-battery switchboard which had been recently installed. This was found to have suffered less than the others, but was at any rate in bad shape. The exact cause of the fire is quite uncertain, but there seems no doubt that it was due to a short-circuit.

Measures were taken at once for making the needed connections for the government offices, the police and the leading administrations. It was at first proposed to connect the 18,000 subscribers to the outlying telephone exchanges of the city, but for this more than 700 miles of cables would have been needed, so the plan was discarded as not feasible. One or more temporary exchanges will be erected at once to establish the downtown service so badly needed. Perhaps two or more permanent exchanges will be erected so as not to concentrate too much apparatus in one building.

The international telegraph wires and long-distance telephone lines were soon restored to service. Not much could be done with the local city lines at once on account of the lack of cable, but after the government offices had been connected lines to the leading banks and journals were completed. The rest of the subscribers were obliged to wait. All the public telephone booths which depended upon the central exchange will soon be connected with the outlying city exchanges, of which there are six, and at the same time a number of temporary booths will be installed downtown. Such a state of affairs will last for two or three months until the temporary plant can be operated.

In order to erect the proposed temporary plant in the central part of the city M. Semijan put forth a project for using the ground of the Place du Carrousel, which lies in the midst of the Louvre buildings and near the Seine. Though it may seem vandalism to spoil this attractive site, it is certain that there is no more suitable spot which lies near the old exchange, since the distance for economy must be kept short. Although the temporary building of brick and iron will be unsightly, it is a case of necessity. At best it cannot be hoped to set up the first of the two multiple boards before six or eight weeks and the second before 10 weeks have elapsed. It happens that the administration has several switchboards which were not in use and were being transformed to the central-battery system. Thus the department expects that within 10 weeks all lines of communication will be re-established. After this it will be engaged exclusively upon the plans for the new permanent exchange, profiting by the lessons of the present disaster.

ELECTRICAL EXPORTS FOR AUGUST

The electrical exports from the United States during August show a gain as compared with the preceding month of July, while presenting a marked decrease compared with those of August, 1907.

The total electrical exports for August, 1908, were valued at $1,101,158, compared with $1,740,793 for August of last year and $952,435 for the month of July of the present year. As classified into appliances and machinery the totals were: Electrical appliances—August, 1908, $437,690; August, 1907, $810,301; July, 1908, $429,080. Electrical machinery—August, 1908, $663,468; August, 1907, $930,492; July, 1908, $523,355.

The principal countries to which electrical products were exported during August, 1908, were:

Electrical appliances — British North America, $111,203; Brazil, $68,301; Mexico, $53,035; United Kingdom, $51,118; Cuba, $37,468; Argentina, $25,377; Central America, $17,225; Japan, $16,526; British Africa, $9,980; British Australasia, $8,583; other South America, $7,808; Germany, $7,597; Philippine Islands, $5,495; Belgium, $5,320; West Indies and Bermuda, $3,293; other Europe, $2,631; France, $2,229.

Electrical machinery—European countries not itemized, $156,513; United Kingdom, $116,376; British North America, $73,933; Mexico, $60,452; Japan, $58,791; Argentina, $38,253; France, $37,161; Brazil, $33,732; British Australasia, $22,053; Central America, $16,452; British Africa, $10,941; other Asia and Oceanica, $9,000; British East Indies, $6,652; other South America, $6,154; Philippine Islands, $5,907; Chinese Empire, $3,619; Cuba, $2,866; other Africa, $1,936; Germany, $1,548; West Indies, $1,129.

WIRELESS TELEPHONY IN NEW YORK CITY

On September 16th the Radio Telephone Company of New York made a successful demonstration of wireless telephonic service between the two new stations that have just been equipped to illustrate to the public wireless transmission of speech under the difficulties peculiar to large cities.

The photographs reproduced herewith show (Fig. 1) the sending apparatus in the transmitting station at the company's laboratory at 103 Park Avenue, near Grand Central Depot, and (Fig. 2) the simple receiving equipment that did the work in the station in the Metropolitan Life Building, at Twenty-third Street and Fourth Avenue, receiving the speeches from the Park Avenue laboratory.

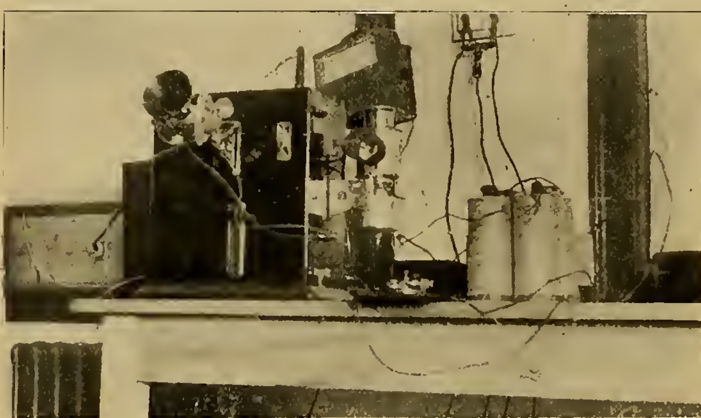


Fig. 1. Sending Apparatus

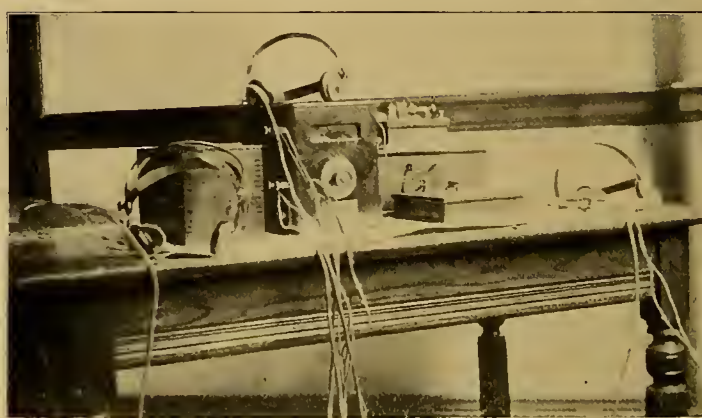


Fig. 2. Receiving Equipment

WIRELESS TELEPHONY IN NEW YORK

The transmission was over a distance of about one mile. It was remarkable chiefly from the fact that the receiving antenna at Twenty-third Street extended above the roof of the Metropolitan building only about 50 feet. The lower portion of the upper antenna was buried, so to speak, within the metal shell of the massive framing of the iron and steel building and thus was electrically "screened."

The transmitting antenna, above the Park Avenue laboratory station, extended to a height of about 123 feet above the roof of the building, and thence was led into the laboratory by way of a window, as shown to the left in Fig. 1.

The electrical energy employed in the demonstration, and by which clear speech was received at Twenty-third Street, amounted to about two amperes or less of oscillating current from a 220 to 225-volt circuit.

The receiving station was equipped with the De Forest audion receiver, tuner and the "loop antenna."

A recent improvement in the Radio company's sending apparatus is shown in Fig. 1.

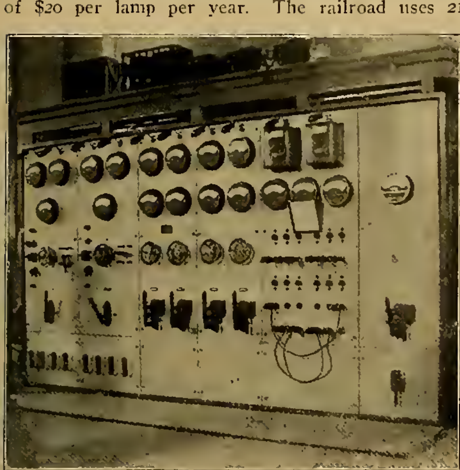
A new method of supply and feed to the alcohol burner keeps the combustible fluid always in good constant supply; and means of easily regulating and trimming the wick is now provided. An automatic feed mechanism for the carbon arc electrode now regulates, by a special solenoid, the length of the arc, and also acts automatically to form the arc again should it from any cause be extinguished.

The demonstration was carried out under the direction of Mr. Roscoe Kent, chief electrical engineer of the company. Messrs. A. S. Moyse and Thomas were in charge at the laboratory end, while W. C. B. Sawler received at Twenty-third Street.

The Carlisle (Ky.) Electric Light and Power Company was closed down in September because of the inability to get water for the boilers. Brushy Fork Creek, from which the company gets its supply of water was as dry as a bone, and there was no way to get water for the plant.

NEW CENTRAL STATION AT COEYMANS

The Atlantic Light and Power Company, at Coeymans, N. Y., supplies street and commercial lighting in Coeymans, Ravena and New Baltimore, and lights the station and yards of the West Shore Railroad at Ravena. The street-lighting system consists of over 200 40-candlepower tungsten lamps on a series circuit, which are carried on a contract of $20 per lamp per year. The railroad uses 21

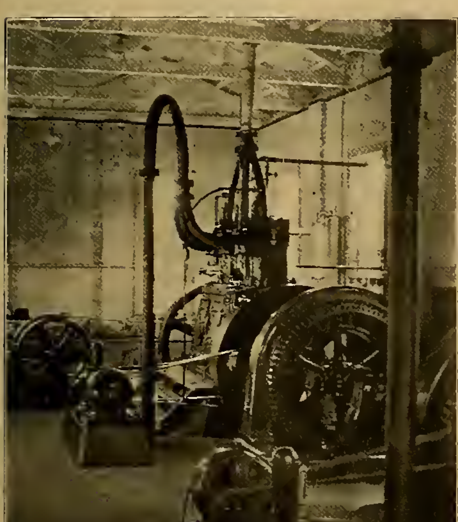


Switchboard
ELECTRIC PLANT AT COEYMANS, N. Y.

arcs and 200 incandescents on multiple circuits. The present commercial lighting load is about 200 tungsten lamps, which the company furnishes to consumers at cost, and about 1,500 16-candlepower incandescents. The lighting rate is 12 cents per kilowatt-hour with a sliding scale of discounts.

Power service has not yet been developed, as the plant has been in operation only since February 29, 1908. Preparation has been made on the switchboard, however, for a power circuit. The power rate will be from 10 cents down to 2½ cents per kilowatt-hour.

Conspicuous in the power plant are two duplicate 85-kilovolt-ampere generating sets, making a total capacity of 170 kilovolt-amperes. It is intended, however, that only one set shall be used at a time, the other being kept as a spare. In case of an increase of the load beyond the capacity of one set, duplicate additional sets will be installed. This provision has secured many customers for the concern as it assures continuous service. The fact



View of Engine Room
ELECTRIC PLANT AT COEYMANS, N. Y.

that the generators used are easily paralleled obviates sudden fluctuations when throwing the load from one generator to another.

Each generating set consists of a Crocker-Wheeler generator coupled direct to a Diesel oil engine. The engines, each rated at 120 horsepower and having three cylinders, 12 by 18 inches, were built by the American Diesel Engine Company of New York. They burn crude oil, which is injected into the cylinders by means of compressed air at a pressure of 900 pounds. For this purpose each engine has belted to it an Ingersoll-Rand two-stage compressor. Cooling water is circulated by a pump belted to each set.

Two 7,500-gallon oil tanks are located about 30 feet from the building. These are buried in the clay soil to exclude water due to sweating. In addition a 10,000-gallon tank is provided at the railroad, from which the oil is carried to the storage tanks in a tank wagon.

A 14,000-gallon cooling tank is installed at the rear of the building. This is of wood, supported on a concrete foundation. The water is delivered as a spray at the top of a series of wooden steps down which it is allowed to drip to the tank.

The generators are 32-pole, 2,300-volt, two-phase, 60-cycle machines at 225 revolutions per minute. They were built by the Crocker-Wheeler Company, of Ampere, N. J., and are of the same general type as the larger machines built by the same company, which operate particularly well in parallel with each other or with machines of other types. The winding of the revolving field consists of strip copper wound on edge, which affords radiating surface for each turn of the winding, thus insuring cool running. The ventilated type of core and housing also insures thorough circulation of air. The use of magnetic wedges in the core slots is a feature of these generators. It permits the use of form-wound and pre-insulated coils and solid pole shoes. The exciter belted to each generator is a compound-wound machine, running at 1,100 revolutions per minute.

The switchboard is arranged in six panels of blue Vermont marble, 90 inches high and with a total length of about 12 feet. The panels are of the Crocker-Wheeler type. The first two panels at the left are combined generator and exciter panels. The next two are feeder panels, each containing two single-phase circuits. Each of these circuits contains a Crocker-Wheeler single-phase feeder regulator, capable of regulating the voltage of the circuit 10 per cent. above or below the bus-bar voltage. The fifth panel contains three 150-light series incandescent systems, for street lighting, with Wood regulators situated behind the board. Integrating wattmeters are provided on this panel to check up the cost of the street and commercial lighting.

The pole line is of such height that the wires are suspended above the lines of the telegraph and telephone companies and above the lines of the old lighting company, some of which still remain. All lines are provided with lightning arresters at the switchboard, at the first pole and at various points along the lines. All guy wires are provided with strain insulators to protect pedestrians, and pole transformers are grounded. Street lamps are permanently suspended from the poles on six-foot and eight-foot arms of one-inch pipe, from the ends of which the lamps are insulated by means of glass petticoat insulators in best Philadelphia mixtures, with General Electric sockets and receptacles.

The cost of fuel and lubricant for the engines is very low, not exceeding 40 gallons of fuel and 1½ gallons of lubricant per day for a run of about 60 horsepower for 10 hours and very light load for the other 14 hours.

The president of the company is Mr. John N. Briggs of Coeymans and the consulting engineer for the plant is Mr. H. B. Sweet of Utica, N. Y.

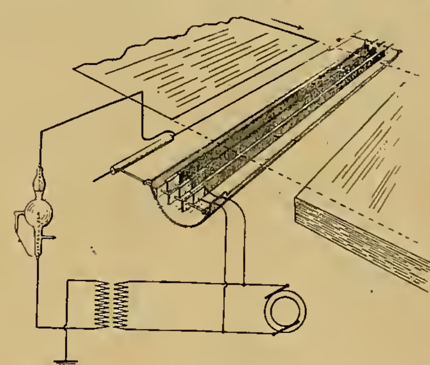
ELECTRIC CLUB OUTING ON DRAINAGE CANAL

Seventy-five members of the Electric Club of Chicago enjoyed an excursion to the electric power plant of the Drainage Canal as the guests of the Sanitary District, on Saturday afternoon, October 3d. The trip going was made by a special car attached to a regular Santa Fe train which followed in sight of the spoil banks of the canal, and deposited the excursionists directly at the Lockport power house. The party inspected the wheel-pits, generators, transformers and high-tension switches, pole line and entries, and witnessed the operation of the great bear-trap dam which was raised for their benefit until the 4,000-gallon flow a second was supplanted by a bucketful. Returning the electrical men boarded the Sanitary District's observation yacht, Robert R., and were afforded an interesting view of the varying characteristics of the canal, first carried high between 40-foot concrete retaining walls, then blasted out of solid rock with banks piled high with the stone spoil, and finally widened to the earth channel merging into the Chicago River. The party was accompanied by several members of the Sanitary District's electrical staff, who explained about the plant and distributed a reprint of the Western Electrician's account of the Drainage Canal power development which appeared in the last New Year's number.

ELECTRICAL PREVENTION OF "OFFSET" IN PRINTING

A method of using electricity at a high potential to prevent printed sheets from "offsetting" or smearing from undried ink as delivered from the press, and incidentally to neutralize any static electricity that may be present on the sheets, preventing their piling properly, has been patented by John Hergesheimer of Philadelphia, and assigned to the Curtis Publishing Company of that city.

The perspective diagram given herewith will serve to show the arrangement of the heater trough with the heating and high-potential connections. The semicircular trough is placed directly beneath the path of the sheets as they leave the press so that in their passage to the delivery pile each sheet for its full length and width is exposed to the heaters enclosed in the trough. These are shown in the form of three wire-wound heating



ELECTRICAL PREVENTION OF OFFSET IN PRINTING

coils wrapped on asbestos or some similar insulating and heat-resisting core and supplied with current from the generator line wires.

A step-up transformer of a high ratio is also connected across the line and by means of the asymmetric resistance or vacuum tube shown in the secondary circuit a unidirectional high potential of electrical stress is delivered to the single horizontal conductor over which the printed sheets pass before reaching the heating element. The other end of the secondary circuit is grounded on the frame of the press.

The sheets are delivered as shown in the sketch moving above and past the device in the direction of the arrow. From the resistance coils heat is radiated on the sheets, and in passing they are subjected to the results of the silent discharge or leakage from the high-tension discharge conductor. A result claimed by the inventor is the generation of ozone and the disturbance of the condition of the surrounding air. These effects in conjunction with heat radiated from the heater cause the ink on the sheets to become so set that offset is obviated.

SPEEDY HEARING ASKED

United States District Attorney Asa P. French asks the Circuit Court at Boston to advance to a speedy hearing the suit of the government against the New Haven railroad to restrain the company from exercising control over the Boston and Maine and interstate trolley roads. The motion was signed by Attorney-general Bonaparte, the action having been taken under the Sherman anti-trust law.

Arrangements for the twenty-seventh annual convention of the American Street and Interurban Railway Association to be held at Atlantic City, N. J., October 12th to 16th, are now practically completed. The indications are for a very successful meeting of the main body and its affiliated associations. Programs of the sessions were printed in the Western Electrician of September 26, page 231.

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

NEW YORK'S electrical show was opened auspiciously on last Saturday night, as related in the account published elsewhere in this issue. A feature of the opening ceremonies was the delivery of phonographic addresses, beginning with the interesting remarks of Mr. Edison, spoken into the phonograph at the inventor's laboratory several days before. The lighting of the show is brilliant, and a special attraction is the historical display of submarine-cable apparatus commemorating the fiftieth anniversary of the laying of the first Atlantic cable.

The list of exhibitors is not a long one, compared with the big Chicago electrical show earlier in the present year, but it contains a number of well-known names. Emphasis is laid on the domestic uses of electricity, and the exhibition promises to be well worthy of the support of both the industry and the general public.

RETURNS of the value of electrical exports from the United States for August possess an element of encouragement in that they are 15 per cent. larger than the corresponding figures for July. Still they are much less than the aggregate for August, 1907. As usual, the United Kingdom and the British colonies lead as the best customers for American electrical manufactures. British North America took $285,136 worth and the United Kingdom $166,494. Including British Australasia, British Africa and British East Indies, the total absorbed by the British Empire is $509,839, or nearly 50 per cent. of the entire electrical exports of this country for the month. Mexico is the third best individual customer, with $113,487; Brazil comes fourth, taking $102,033 worth, and Japan is fifth, with a record of $75,317. The total valuation of the electrical exports for August, 1908, is $1,101,158.

FEWER PAPERS are to be presented hereafter at the annual conventions and New York meetings of the American Institute of Electrical Engineers. The announcement is made in the "Proceedings" of the Institute for October, and we are sure it will be heartily welcomed. It is proposed to accept but one paper for each monthly meeting in New York during the present season, to be followed by prepared discussion closing not later than ten o'clock, at which hour impromptu discussion will be invited.

This arrangement is a sensible one and is to be heartily commended. The tendency at nearly all electrical conventions and technical meetings is to prepare a program containing too many papers. There should be fewer papers, and these prepared with care, but more discussion. Another improvement would be an introductory summary of each paper, showing the conclusions reached or giving the gist of the paper, this to be followed by the description or reasoning or inquiry which forms the bulk of the paper. An admirable résumé of this character was given with Mr. Mershon's paper on "High-voltage Measurements at Niagara," presented at the Atlantic City convention of last July. In this case, however, the conclusions were given at the end of the paper. A better place is at the beginning, so that the reader may gain an idea, first of all, of the upshot of the author's effort.

RUBBER still plays an important in the electrical industry as an insulating material, although paper has taken its place to a very considerable extent in cable insulation. It is important, therefore, to note the depressed condition of the Brazilian rubber market as reported by the United States consul-general at Rio de Janeiro and mentioned elsewhere in this issue. The demand for rubber has notably decreased in the last year or more, owing to the slackening in trade, and prices have been unsatisfactory to the Brazilian producers. The cost of the raw product is increasing also, owing to the constant necessity of penetrating into more remote regions of the forest to find the trees and to the increase in the price of labor.

Nearly two-thirds of the world's supply of rubber comes from the wild trees in the Amazonian forests of South America. Practically the whole of this amount is collected by hand and treated by hand in small quantities. The milky sap is collected by the gatherer and is coagulated by smoking it at the end of a stick over a wood fire. This process is continued until a ball of rubber weighing from three to 30 pounds is produced. Attempts have been made to treat the raw caoutchouc in bulk, but so far apparently without success. It would seem that there should be a great opportunity both for the more extended cultivation of rubber trees and for the invention of a less primitive way of treating the sap.

FOR OVER three years the New York Edison Company has followed the plan of carrying its own liability insurance. In other words, instead of paying a premium to a liability insurance company it has developed its own system of compensation to injured employes. This system is described in an interesting paper prepared by Messrs. E. M. Atkin and H. M. Edwards and read at the Edison convention at Lenox last month. The injured man is sent to the company's doctor and is given free medical or surgical care, regardless of the responsibility for the accident. In return he is asked to sign a release discharging the company from all demands due to the accident. Furthermore, during the period of disability the employe is paid full, half or quarter wages, according to the conditions of the case. The pay-roll receipt is in the form of a further discharge for the company.

If an employe refuses to sign the release form during his first visit to the doctor, the fact is reported at once to the bureau of claims, a representative of which visits the man, explains the company's practices to him, and points out the advantages of relying upon its protection. The injured man is told that he will receive his wages promptly and will not be obliged to wait during the long period which is required to terminate a litigation; that he will save all legal expenses, including that large percentage of the amount recovered which is usually taken by "negligence lawyers" working upon a contingent basis, and that his position will be open to him when he is again able to work. It is not withheld from him that there are certain advantages accruing to the company from this method of settlement; the idea being fully to inform the employe of his exact situation and to deal with the subject with entire frankness. As a result of this policy out of all the accidents that have happened in the two years 1906 and 1907 only six employes refused to sign the release and sued the company; and of these six five were unsuccessful, and their cases were dismissed by the courts upon their merits; the sixth case was adjusted out of court.

The authors of the paper note that the company has been disappointed thus far in the lack of effective safeguards developed and also in the lack of caution exercised by the employes while about their work. Of 867 accidents in 1907, 646 were due to the negligence of the injured men themselves. The plan seems to be a financial success, costing a little less than the insurance premiums would. The general relation between the company and its employes is most satisfactory, and on the whole the company is well pleased with the results achieved by its plan for disability compensation.

In the administration of this system the company has accumulated a mass of statistics relating to the nature and cause of accidents. It is shown, for instance, that of the 867 accidents of 1907 the company was probably liable for 98, or 11 per cent. What is particularly interesting is the small proportion of purely electrical accidents. Thus, out of the 867, 111 were due to short-circuit burns and 13 to direct-contact burns. All others were due to falls, explosions, moving material, cuts by knives or saws, the use of tools or other causes that might be present in any large establishment where machinery is used. This record seems to show that the electrical hazard pure and simple is not so great as might be supposed it would be in the commercial production of electricity.

FIRST NIGHT OF THE NEW YORK ELECTRICAL SHOW

"Commemorating Fifty Years of Trans-Atlantic Communication by Cable and the Passage of the First Quarter Century of Electrical Service in New York," the second annual Electrical Show of that city opened its doors to the public at Madison Square Garden at eight o'clock, Saturday evening, October 3d. A few of the exhibits were still in an embryonic state, but as a whole the show stood forth a fine embodiment of the actuality of electrical progress.

While the doors were opened at eight o'clock, the exhibits were not officially in operation until an hour later.

A program especially prepared for the initial night was conducted in the Concert Hall of the Garden. This commenced, as announced, at 8:30. The unique feature of these opening exercises was the fact that the participants, with one exception (Mr. W. W. Freeman of the Brooklyn Edison Company), were many miles away. The Edison phonograph is the answer to this seeming impossibility, and this was the first meeting of its kind to be conducted wholly by phonographic-record proxy.

The opening address delivered, or re-delivered, by Thomas A. Edison, honorary president of the Electrical Show, was made in Mr. Edison's own laboratory and was listened to with curiosity as well as interest. Mr. Edison said:

"Those of us who began our labors at the operator's keys 50 years ago have been permitted to see and assist in the whole modern industrial development of electricity. Since the remarkable experiments of Morse in 1844 and the unsuccessful attempt of Field in 1858, there have come with incredible rapidity one electrical art after another, so that in practically every respect civilization has been revolutionized. It is still too early to stand outside these events and pronounce final judgment on their lasting value, but we may surely entertain the belief that the last half of the nineteenth century was as distinct in its electrical inventions and results as the first was in relation to steam.

"The lesson of the jubilee of the Atlantic cable of 1858 is one of encouragement to all who would add to the resources of our race and extend our control over the forces of nature. Never was failure more complete, never was higher courage shown, never was triumph more brilliant than that which since 1866 has kept the Old World moored alongside the New by pulsating cables of steel and copper—the 'family ties' of the civilized world.

"When I look around at the resources of the electrical field today as shown at this exhibition I feel I would be glad to begin again my work as an electrician and inventor, and we veterans can only urge upon our successors, the younger followers of Franklin and of Kelvin, to realize the measure of their opportunities and rise to the height of their responsibilities in this day of electricity."

This was followed by two-minute speeches by Louis A. Ferguson of Chicago, president of the American Institute of Electrical Engineers; W. C. L. Eglin of Philadelphia, president of the National Electric Light Association; W. W. Freeman of Brooklyn, president of the Association of Edison Illuminating Companies; E. G. Acheson of Niagara Falls, president of the American Electrochemical Society, and H. A. Lardner, president of the New York Electrical Society. The last, and official opening speech, was made by Hon. Charles E. Hughes, governor of New York state. At precisely two minutes past 9, October 3d, the record, made by Governor Hughes, at 6 p. m., October 1st, repeated the words, "And now I declare this electrical show open," that set the actual machinery of the New York Electrical Show going.

Madison Square Garden has never before experienced the blaze of brilliancy that it is now enjoying. The electrical show of last year, while most successful, was only a primitive effort beside the results attained this year. The extensive use of the tungsten lamp for lighting and decorative purposes is responsible for a wonderfully increased beauty in the garden; the general hustle of the promoters of the show is responsible for the greater excellence and number of the exhibits.

Directly after dark on Saturday night the well-known searchlight belonging to the New York Times that had been tendered for the occasion commenced its work of focusing on the tower of Madison Square Garden the attention of all the city of New York that came within its radius. Following with the eye this long-distance light, those near enough to distinguish might read the big electric sign announcing the Electrical Show. The outside illumination was further enhanced by 10 Excello arc lamps that lighted the entire block before the entrance. The light of the lobby was furnished by Moore tubes.

Within the great exhibition hall no one light reigned supreme—all of the latest improved electric illuminants were doing their part. Electric signs with myriads of shining globes made the great hall brilliant. Never has the famous garden been so resplendent. Even in the remotest corners no shadows lurk. It is light—light from end to end, from door to dome.

The booths of the N. E. L. A. engineering department and the United Electric Company of New York are the first to claim the attention on entering the building. The New York Edison and the General Electric companies occupy the largest spaces on the main floor and are located almost directly in the center of all displays. The real novelty which is being shown at the latter exhibit is the new General Electric 25-watt tungsten lamp. The Brooklyn Edison Company is on the same vantage ground as last year, with a thoroughly unique exhibit showing the industrial, commercial and domestic uses of electricity.

These three are undoubtedly the basic exhibits of the show, but they have no monopoly on the interest of the visitors. Every exhibitor is showing the latest thing in his line and every booth receives its just share of attention.

The exhibit of the historical submarine cable, of which this year's show is in special commemoration, is in the balcony. It does not take an electrical expert to enjoy the details of this. It deals with the attempts in 1858 to establish telegraphic communication between the British Isles and America, and by means of a fine collection gives an adequate idea of the work done since that date on ocean telegraphy. This department is of inestimable educational value. The articles of this collection were loaned largely by the Metropolitan Museum of Art and by the Commercial Cable Company. Another historial feature is the unique collection belonging to the New York Electrical Society, showing sections of an actual submarine cable laid prior to the efforts of 1858.

The historical lighting committee has arranged an exhibit showing the evolution that, from the lighting standpoint, has made the present show possible. The apparatus here shown dates from 1882 and is a comparative study of the development of the art of electric lighting.

There is a daily practical demonstration of the Marconi wireless, with news bulletins furnished twice a day by the New York Times. Wireless telephony is also exhibited to the general public. "Back to the Farm" is the motto of the farm committee, and the basement has been turned into a veritable farm yard with dairy and chicken yard, where cows are milked and chickens hatched by electricity.

This is just a hint of the wonders of the exhibits which embrace everything from the tiniest household device that can be electrically operated, including the latest Simplex heater for kitchen water boilers to electric pianos, or the heavy electric equipment for subway construction.

The show promoters have not stopped with these things, however. They have also arranged for a series of lectures to be given each night in the garden concert hall. Prof. Sidney W. Ashe, Mr. Max Loewenthal and Frederick A. Collins will deliver these lectures.

Among the exhibitors are the following-named: Campbell Electric Company, Lynn, Mass.; Driver Harris Wire Company, Harrison, N. J.; Edison Electric Illuminating Company of Brooklyn; Edward E. Cary Company; Electric Home Supply Company; Electric Motor and Equipment Company, Newark, N. J.; Electrical Testing Laboratories; Enos Company; Excello Arc Lamp Company; F. Alexander Electric Company; Federal Sign System; Fox Bros. & Co.; General Electric Company; German-American Electric Company; Gould Manufacturing Company; Habirshaw Wire Company; International Text-Book Company; Manhattan Electrical Supply Company; Marconi Wireless Telegraph Company; Murphy Rectifier Company, Rochester, N. Y.; National Electric Lamp Association, Cleveland, Ohio; Otis Elevator Company; Popular Electricity, Chicago, Ill.; Spencer Turbine Cleaner Company; Stanley & Patterson; Tel-Electric Music Company; the New York Edison Company; United Electric Light and Power Company; Watson-Stillman Company. F. N.

OPENING OF ILLUMINATING CONVENTION

Philadelphia, October 5.—The second annual convention of the Illuminating Engineering Society is being held here under auspicious circumstances. Philadelphia is in gala attire on account of its Founders Week celebration in commemoration of the two-hundred-and-twenty-fifth anniversary of the birth of the city.

As might be expected, electricity is being generally used in the scheme of decorations. Many of the important buildings are outlined with thousands of electric lights. The Bulletin newspaper building is decorated in a very effective way by being outlined in incandescent lamps and, in addition to this, the interior on all floors is brilliantly lighted with mercury lamps. The greenish light emanating from all the windows makes a very striking appearance in contrast to the incandescent lamps which surround the windows as well as define the general structural lines of the building.

This convention, from the amount of interest and enthusiasm displayed by the delegates, promises to be very successful indeed. The registration, although not yet complete, has reached 225, which is more than the entire registration of last year.

The first formal meeting was opened Monday morning by Mr. George Ross Green, chairman of the convention committee, who, in a few appropriate remarks, welcomed the delegates and ladies. Mayor Reyburn, through his private secretary, gave a hearty welcome on behalf of the city of Philadelphia.

Dr. Louis Bell then delivered the president's address. His subject was "Some Principles of Street Illumination." His plea is for better illumination in our streets. He compared European to American standards in this matter, rather to the detriment of the latter. He considered the subject under three classifications—first, the main avenues of business; second, the streets not quite so generally used, and third, or tertiary streets, the ones in general residence districts.

For the first division he holds that the intensity of illumination should be such that one can with ease read printing or writing in any part of the street. Sufficient light is provided on the main streets of European cities to accomplish this, and in this class of streets the foreign cities take the lead.

For the secondary streets, the European and American practice is almost the same. In the European cities, however, units of high intensity are almost always covered by diffusing shades, which is an improvement over the practice which obtains in this country. In secondary streets Dr. Bell condemned the practice of placing intensely high-candlepower units simply at the street intersections, and advocated in its stead the use of smaller units spaced closer together.

The speaker stated that in his opinion the minimum illumination on any portion of a street should be four or five times that produced by moonlight, for the reason that with the moon the light is very much diffused, so that the eye works at maximum efficiency, but in street lighting the brilliancy of the illuminants reduces the aperture of the eye and consequently a higher degree of illumination is required to see things with the same degree of ease.

Dr. Bell closed his address with a prediction that three or four years would see a very marked change in the matter of street illumination, much to the benefit of all.

The report of the committee on nomenclature and standards was then given. As the work of the committee is not yet completed, no action was taken on the report. Such progress is being made in this work that it is safe to say that in the near future an international standard of light will be adopted, the standard to be an average of the standards now employed in America and the leading European countries, excepting Germany, whose standard, the hefner, varies too much from the others to make it advantageous to include it.

The morning session was then closed and the delegates adjourned to the dining room, where a delightful luncheon was served. Plenty of entertainment is being afforded. This afternoon is being spent in viewing the military parade. This evening the second session of the convention will be held, at which five papers will be presented. During this time the ladies will be suitably entertained by theater parties, card parties, etc.

An interesting feature of this convention is the exhibition on the tenth floor of the Hotel Walton. The historical features have not been overlooked, as a series of old forms of lamps are shown, going back to early types of oil lamps of the ancients and extending to the modern lamps of the present day. More about the exhibits will be given with the conclusion of the Western Electrician's report next week. J.

OLD-TIME TELEGRAPHERS' REUNION

Two hundred telegraph operators or former operators—many of whom rendered invaluable service at the key in the days of the Civil War—attended the twenty-seventh annual reunion of the Old Time Telegraphers' and Historical Association, and the Society of the United States Military Telegraph Corps, held at Niagara Falls, N. Y., last month. Harvey D. Reynolds, as president of the old-timers' association, and Col. William B. Wilson, president of the Military Telegraph Corps, presided at the meetings of their respective joint organizations. The meetings proved real reunions, and the old associates and friends spent the pleasant days in recalling their exploits of the past. Letters were received from Col. Robert C. Clowry, Clarence H. Mackay and the managers of other telegraph companies tendering the free use of their wires during the convention. Telegrams were addressed to Andrew Carnegie, President Roosevelt and many other prominent men who have been at some time identified with the civil and military telegraph service.

President Wilson of Philadelphia was continued in his position by the military telegraphers, David Homer Bates of New York was elected secretary and treasurer, and William L. Ives of New York and Charles A. Tinker of Brooklyn, N. Y., vice-presidents. The Old Time Telegraphers elected E. B. Saylor, president; C. E. Bagley of Pittsburg and W. J. Camp of Montreal, Que., vice-presidents, and Frank J. Scherrer of New York, secretary.

SONS OF JOVE TO MEET IN BUFFALO

The sixth annual meeting of the Order of Rejuvenated Sons of Jove will be held at the Iroquois Hotel, Buffalo, N. Y., on October 14th, 15th and 16th. The convention will open with a reception at the hotel at 8 o'clock on the evening of Wednesday, the first day. At 9 o'clock on Thursday morning a special train will leave for East Aurora, where Elbert Hubbard, "Fra Elbertus" of the Roycrafters, will address the Sons of Jove. At noon all will sit down to luncheon in the Philanstery.

Returning to Buffalo a business meeting will be held at the Iroquois Hotel at 2:30 p. m. At 8 p. m. will be held the illuminated Jovian parade, foreshadowed as "a marvel of electrical effects, music, fireworks, imps, victims and police." After the parade there will be a grand "rejuvenation" at the cathedral of the Scottish Rite Masons, and at 11 p. m. a "joviation" accompanied by a Dutch lunch, music, songs and some speeches.

Friday morning will be given over to unfinished business. A "standing luncheon" will be served at 1 o'clock and in the afternoon new officers of the order will be elected and installed. The annual meeting will be closed with a grand banquet on Friday evening at 7 o'clock.

CHICAGO ELECTRICAL SHOW

Chicago's fourth annual electrical show will be held in the Coliseum during the two weeks from January 16 to 30, 1909. The same general plan of arrangement of the exhibition space will be used as at this year's show. The management of the 1909 show feels that the outlook is better than for any previous one and predicts a successful exhibition. The electrical show is held annually by the Electrical Trades Exposition Company, incorporated for that purpose, with offices at 1006 Monadnock Building, Chicago. Homer E. Niesz is manager.

WESTINGHOUSE READJUSTMENT

President George Westinghouse of the Westinghouse Electric and Manufacturing Company has issued a circular to the stockholders, personally appealing to them to support the modified readjustment plan based upon the merchandise creditors' plan which has just been adopted by the readjustment committee. The following estimate has been prepared of the resources and requirements of the company for the five years beginning April 1, 1908:

	Minimum.	Probable.
Cash from sale of capital stock	$ 6,000,000	$ 6,000,000
Cash on hand	3,890,000	3,890,000
Special deposits	1,535,120	1,535,120
Notes receivable available for discounts	1,250,000	1,250,000
Total cash	$12,675,120	$12,675,120
From sale three-year notes	4,000,000	6,000,000
Income from securities, royalties etc.	2,500,000	6,000,000
Manufacturing profits	15,000,000	25,000,000
From sale convertible bonds under sinking fund operation	1,600,000	2,000,000
From sale of investments	2,415,800	2,415,800
Total resources	$38,190,920	$54,090,920

As against these resources the total requirements under the merchandise creditors' plan, based on bank creditors accepting 20 per cent. of claims in assessing capital stock, would be $23,161,700. Add 6 per cent. dividends on $35,500,000 assenting stock for five years, $10,650,000; grand total, $33,811,700. The total requirements under the plan based on bank creditors accepting 5 per cent. of the claims in assenting capital stock would be $20,217,075. Add 6 per cent. dividend for five years on $37,875,700 assenting stock, $11,362,710; grand total, $31,579,885. The maximum or the minimum requirements under the readjustment plan would be covered by the estimated minimum resources from five years' period. This may be tabulated as follows:

First comparison—	Minimum.	Maximum.
Resources	$38,190,920	$54,090,920
Minimum required with dividends	31,579,785	31,579,785
Excess resources	$6,611,135	$22,511,635

BRAZILIAN RUBBER SUPPLY

The actual state of the rubber industry in Brazil, according to United States Consul-general Anderson of Rio de Janeiro, is indicated by the fact, related in the annual report of the minister of finance, that the value of the exports of seringa rubber during the first three months of 1907 was $25,943,547, while the value of the exports of this variety during the first three months of 1908 was $16,443,566—a difference of $9,499,981 on that variety in a single quarter. While prices have recovered somewhat from the extremely low level which they reached during the beginning of the year, it is generally accepted as an established fact that they will not reach their former level for an indefinite period. This fact is of the most serious import to rubber exporters in Brazil, for the expense of gathering the gum is constantly increasing. The price of labor in the rubber country has augmented until it is impossible for rubber collectors to be found at prices which dealers can pay in many of the districts concerned in rubber work. On the whole, rubber is costing more than it has in the past, and it is likely to cost more in the future. The disposition of the selling market to sag at the least possible excuse and the increasing supply of rubber from plantation sources render the position of the Brazilian industry precarious, and the governmental authorities are making every effort possible to induce the people interested in rubber to give their attention to the growing of other and varied crops.

ALLIS-CHALMERS COMPANY MAKES GOOD SHOWING

In the year ended June 30th last the Allis-Chalmers Company more than doubled its profits from operation over those of the preceding fiscal year. The report of the company's operations, addressed to the stockholders, shows total earnings of $2,573,061, after the deduction of manufacturing and selling costs and the dividends on the outstanding preferred stock of the Bullock Electric Manufacturing Company. This compares with $1,226,000 in the preceding year and $648,161 in 1905-6.

The net profit in the year now reported was $615,814 after the deduction of $1,958,146 for maintenance, depreciation, interest and special reserve, that comparing with an operating deficit of $387,298 in the preceding year. The net profit made in the last year figures about 3.8 per cent. on the company's preferred stock, and the surplus—$385,997 after wiping out the previous deficit—figures about 2.4 per cent. on the preferred stock issue.

President Whiteside declares "noteworthy success has been attained in the sale and operation of our new lines of production, namely, gas engines, steam turbines, hydraulic turbines and electrical apparatus, which are now among the standard products of our company, their development having been completed since the last report. The extensive use of these lines of production, often in connection with our older products, not only by purchasers who have long been regular customers but by numerous new customers in almost all classes of industry, forms the basis for an increasing and profitable business."

QUESTIONS AND ANSWERS

THREE-PHASE DISTRIBUTION

A. L. R., Leetonia, Ohio: We are contemplating buying power from a railway company as three-phase, 25-cycle, 22,000-volt current. Would it be best to distribute this power as three-phase current or reduce it to two-phase? The town has about 3,500 inhabitants that are scattered a great deal. Both light and power are to be supplied.

Answer

There would be no advantage in transforming from three-phase to two-phase. The former system is as well adapted for distribution in the particular situation as the latter system. The lights must be so wired as to balance them quite evenly on the three sides of the system. Motors are wired directly on the three wires. If an unbalanced load cannot be avoided the distributing system can be laid out as a four-wire three-phase system by connecting the secondaries of the step-down transformers on the Y or star plan and running a neutral wire from the common point. In this case the lights are wired between the three main wires and the neutral and the motors between the three mains. In either the delta or star connection the lights are run just as on single-phase circuits, since they in effect form three single-phase branch circuits of the system.

CONNECTIONS OF AN ASTATIC AMMETER

E. B., Marytown, W. Va.: Kindly tell me how to connect up a Thomson direct-current astatic ammeter made by the General Electric Company. This meter is equipped with the usual ammeter shunt and cord and is of the switchboard type. It has four terminals, however, two on each side, the two on the left side being marked 250V. As the cord from the shunt can be connected to only two of these terminals, where are the others to be connected?

Answer.

This type of instrument has an electromagnetic field instead of the usual permanent magnetic field of direct-current instruments. The electromagnet is wound for any specified voltage and has special terminals distinct from those of the current carrying coil. In this case they are intended to be excited directly from 250-volt bus-bars. The two other terminals are to be connected to the shunt as in the ordinary types of shunted ammeters.

DESTRUCTION OF BACTERIA IN WATER

E. J. P., Chicago: Kindly tell me if 110 volts will destroy all germs in running water.

Answer

The passage of a current through contaminated water does not directly result in the destruction of bacteria, regardless of the voltage used. If salts of any kind are present the current causes their decomposition or ionization, and the chemical products formed from these ions attack and chemically destroy the bacteria. Thus, common salt is ionized in such a way that hydrochloric acid is formed at the negative electrode and caustic soda at the positive one. The heating effect of the current might destroy bacteria only if it was great enough to boil the water for nearly half an hour; the current expenditure in this case would be altogether excessive and not practical therefore.

ALTERNATING CURRENTS AND THEIR APPLICATIONS

By Edson R. Wolcott

CHAPTER I.—GENERAL PRINCIPLES

Part II.

Generation of Alternating Currents (*Continued*).

Starting with the coil as shown, that is, in a plane at right angles to the magnetic field, as represented by the lines *N S* (Fig. 4, page 249), a current will be generated in the rectangle in the direction indicated by the arrows provided the magnetic field has the direction as shown. The north-seeking pole is indicated by *N*, while *S* indicates the south-seeking pole of the magnet (not shown) generating the magnetic field.

As a mere matter of definition a magnetic field is said to consist of lines of force having a direction from the north-seeking pole through the air or other intervening medium to the south-seeking pole.

It has been found by experiment that an electric current is generated in a conductor whenever the conductor is moved with respect to a magnetic field. The direction in which such a current will flow in the conductor under the conditions as stated is shown by the arrows. It can be briefly stated as follows: If the fingers of the right hand point in the direction of the lines of force and the rotating conductor move toward

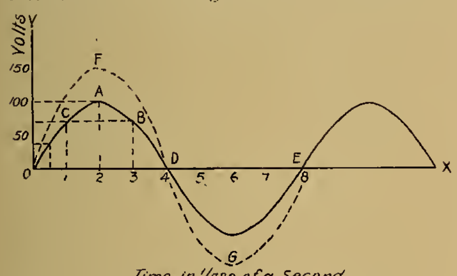


FIG. 5. CURRENT AND VOLTAGE CURVES OF AN ALTERNATOR.

the palm of the hand, so that the fingers can grasp it, the current will flow in the direction of the extended thumb.

As the rectangle passes through the position shown in Fig. 4, that is, with a maximum number of lines of force passing through it, the current therein is zero, for it is at that instant cutting no lines of force. This condition is shown by the point *O* in Fig. 3; 1-480 of a second later the rectangle has completed one-eighth of its revolution; it has, therefore, moved through an angle of ⅛ of 360° or 45°, and the value of the current is about 0.7 ampere, as shown at *C*.

Similarly, 2-480 of a second from the start the rectangle has moved through an angle of 90° and

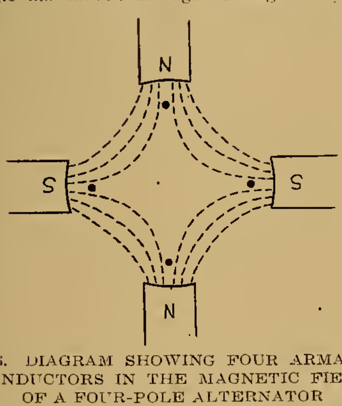


FIG. 6. DIAGRAM SHOWING FOUR ARMATURE CONDUCTORS IN THE MAGNETIC FIELD OF A FOUR-POLE ALTERNATOR

the current has reached a maximum of one ampere, as shown at *A*. The rectangle is then parallel to the magnetic field. In 3-480 of a second the current is again 0.7 ampere and the rectangle has moved through an angle of 135°, as shown at *B*; 4-480 of a second from the start the current is again zero, as shown at *D*, and the rectangle makes an angle of 180° with its original position: that is, it is again at right angles to the lines of force. At this point it has just ceased cutting the lines in one direction and is about to begin cutting them in the other direction. In 8-480 of a second, as represented at *E*, the current is again zero and the rectangle has arrived at its original position.

Collecting Rings

Since the terminals of the rectangle remain in contact with the same collecting rings, shown at *X* and *Y*, Fig. 4, the current in the external circuit corresponds in its changes to that in the rectangle itself, and is, therefore, alternating. In a direct-current generator the connection of the generating coils to the external circuit are changed

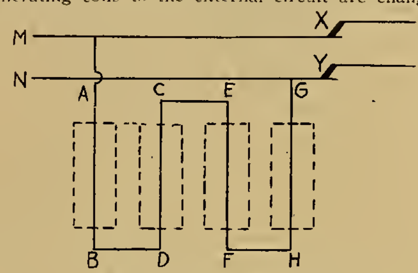


FIG. 7. CONNECTIONS OF A FOUR-POLE, FOUR-CONDUCTOR ALTERNATOR

by means of a commutator whenever the current changes direction in the coil.

Mechanical Analogy with Pendulum

There is a mechanical analogy between the graphical representation of an alternating current and the swinging of a pendulum. The speed of the pendulum varies with time just as the current strength changes with time. Let the pendulum be drawn back and released, its speed increases until it reaches the center of its arc. Then it begins to decrease and becomes zero at the other end; the speed then changes direction, increases until the center is reached, and so on.

If the speed of the pendulum be plotted along the line *O Y*, in Fig. 3, and time along the axis *O X*, a curve of the same shape as that representing the change of current with time. In fact, by

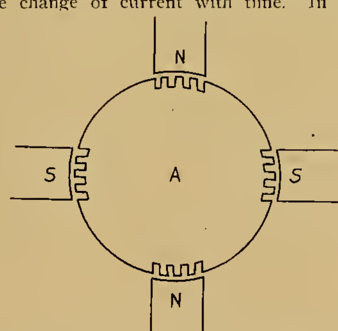


FIG. 8. DIAGRAM SHOWING SLOTS IN THE ARMATURE OF A FOUR-POLE ALTERNATOR HAVING FOUR ARMATURE CONDUCTORS PER POLE

choosing the proper units of time and speed, the two curves can be made to coincide.

Electromotive Force Curve

When an alternating current of electricity flows in a conductor there is of course an alternating electrical pressure producing it. A curve can be drawn showing how this electromotive force changes with time, and such a curve is illustrated in Fig. 5 by the solid curved line. This curve is just like that used to illustrate the change in current, except that the axis *O Y* now represents volts instead of amperes. To be sure, the dotted line could represent electromotive force: the only difference between the two is that one reaches a maximum value of 100 volts and the other attains a maximum value of 150 volts.

It is often customary to represent both current and electromotive force together. Thus, the curve *O C A B D* may represent an alternating current having a maximum value of one ampere and the curve *O F D G* may represent an alternating electromotive force having a maximum value of 150 volts. In the latter case the axis *O Y* would represent volts, in the former amperes. The scale might even be different in the two cases; the line tangent to the point could be read as 100 when referring to the curve of electromotive force and 1 or 10 when referring to the current curve.

The Alternator

In the commercial generator of alternating currents more than one winding is rotated in the magnetic field, and usually more than one pair of magnetic poles are used. In the case of a multipolar

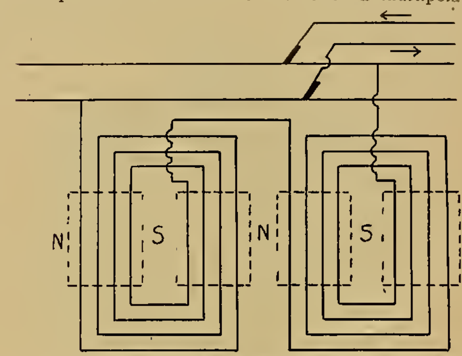


FIG. 9. CONNECTIONS OF A FOUR-POLE ALTERNATOR HAVING FOUR ARMATURE CONDUCTORS PER POLE

machine, opposite kinds of poles are arranged adjacent to each other as shown in Fig. 6. The lines of force then follow the paths indicated by the dotted lines. The black dot in front of each pole represents the cross-section of one of the four conductors, all of which are connected together, as shown in Fig. 7.

This illustration does not represent the actual appearance of the conductors, but merely shows the method of making connections. *M* and *N* represent the collecting rings with the brushes making contact at *X* and *Y*. The dotted lines represent the four pole-pieces, and the lines *A B*, *C D*, *E F* and *G H* the four conductors which are connected in series as shown.

These conductors are usually imbedded in iron to increase the strength of the magnetic field around them and decrease the magnetic leakage. It is also customary to wind more than one conductor corresponding to each pole, as shown in Fig. 8. Here *A* represents the iron core of the armature, which has four slots on its circumference under each pole. Each of these slots carries a conductor. These conductors are connected in series, as shown in Fig. 9, where the dotted rectangles represent the poles and the concentric heavy rectangles the windings. The collecting rings and brushes are represented as in Fig. 7.

[*To be continued.*]

BOOK TABLE

Wireless Telegraphy and Telephony. By Walter W. Massie and Charles R. Underhill, with a special article by Nikola Tesla. New York city: D. Van Nostrand Company. 1908. Pp. (4½ by 7½ inches), 71, with 28 illustrations. Price, in cloth, $1.

The lay reader or the amateur in "wireless" will find much interesting and instructive information in the pages of this book. It is all so simply told and the accounts of electrical phenomena so aptly illustrated by familiar analogies that the boy or the non-electrical reader may easily grasp the ideas of the functions of the oscillator, antennæ, coherer, etc., without difficulty.

The information is imparted in simple words and diagrams that betray, however, a deeper knowledge than the elementary matter the book contains. The several principal methods of wireless telegraphy and telephony are explained by drawings and photographs and some comments are inserted on the commercial aspects of wireless communication. The little book teaches its simple lessons rather well, even if the total contents are but scant to be bound between boards and carry such a comprehensive title. A four-page verbatim interview with Nikola Tesla on "The Future of the Wireless Art" forms the last chapter.

The board of directors of the Northwestern Electrical Association recently held a meeting in Chicago for the purpose of arranging a program for the next meeting of the association which will be held in Milwaukee, Wis., in January. It is the desire of the officers to make this meeting the most successful one in the history of the association. Roger N. Kimball, Kenosha, Wis., is secretary.

SELLING ELECTRICITY

Under this heading will appear, from time to time, articles, suggestions and examples which will be of assistance in the constant effort to increase the existing demand for electric current and to create new demands.

A STUDY OF RESIDENCE LIGHTING[1]

This paper states conclusions following 10 years' study of residence lighting, particularly in Detroit. The beginning of electric lighting of residences in Detroit was in 1889. Its rapid growth dates from 1898. During that period the opportunity for such study in that city has been and is exceptionally extensive, as is indicated by the following tabulation. It will appear as the paper proceeds that we have given some study to other cities:

July 1, 1908.	Area Square Miles.	Population.	Total Number Customers.	Residence Customers.
Toledo	29	180,000	8,400	3,500
Louisville	28	250,000	6,147	4,000
Minneapolis	52	300,000	7,170	3,000
Washington	68	315,000	6,176	3,132
Detroit	35	360,000	19,866	11,249
Cleveland	49	493,000	16,750	11,684

The connected load of lights alone—that is to say, not including fans, flatirons, cooking utensils, etc.—is found, in groups of old-fashioned residences wired more than 10 years ago, to be in relation to the maximum demand of the group, very closely four to one. In groups of residences recently built the ratio is approximately five to one. A representative group of 905 residences, built within the last 10 years, showed on test a ratio for the group of 4.7 to 1. The increasing ratio of connected load to demand in residences more recently built is found to be due to the greater number of convenience lights installed; that is to say, lights not required for general lighting but used occasionally. An architect now specifies such lights in all closets, on all stairways, in attics, storerooms, etc. Cheaper wiring, cheaper snap switches and lower electric-light rates are responsible for this change in wiring practice.

The maximum does not change very much throughout the year. Demand indicators, installed in 100 residences showed marked reduction in the demand only in June, July and August, and the lowest reading is 75 per cent. of the winter maximum. Of course, there is a considerable reduction in the units used during summer months, and the maximum does not arrive until later in the evening.

The hour of maximum demand of a residence district has never varied in our observation. It has always come about 15 minutes previous to the time of the evening meal; that is to say (in towns where the standard time and the sun time coincide fairly well), the maximum demand in a residence district will come at about 6:15 p. m.; continue until about 8 p. m., and fall slowly till 10:30 p. m. The residence-district demand comes later than the business-district maximum, and is falling at the time that the demand due to theaters and other places of entertainment is rising. The sequence is obvious. Lights are turned out in offices when people go home for supper, and people don't go to shows until after supper. The maximum in residences tends to coincide with the latter part of the demand for power for the street cars which carry people from their offices to their homes; precisely as the maximum of the business district tends to coincide with the first part of the street-railway evening load. This sequence also is obvious. The street cars are loading in the business center at the time when people are closing their offices and storerooms, and the street cars are arriving in the residence district at the time that the evening meal is being got ready for the home-comers. That the maximum call for street-car power comes later in the outlying districts than in the business center is a common observation. Of course there are exceptional cities. Our observations apply to the general run of American cities and are correct for the outlying areas of the exceptions.

A residence district so large as to include a majority of middle-class residences always shows sales increasing as the sun sets early and conversely decreasing as sunset becomes later. The December sales in a middle-class district will be 13 to 14 per cent. of the annual sales. The monthly sales during midsummer may be four or five per cent. of the annual sales. These comparative values are being changed by the use of fans, flatirons and other electrical devices adapted to household use. The summer fan load is very perceptible in the business of southern cities. In Detroit we find that the average six-pound household iron adds about 10 units per month to the number of units per residence, and this addition is practically uniform from month to month throughout the year.

1. A paper (slightly condensed) read before the Association of Edison Illuminating Companies at Lenox, Mass. September 15, 1908. This paper expresses the views of the new-business and metering and accounting departments of the Edison Illuminating Company of Detroit, and is of such composite origin that no author's name (or names) can be attached to it.

When it is not uniform it is because the electric iron is used only in the summer months, and such cases, added to the summer use of fans, tend to increase the number of units sold at the time of the year when we are most willing to make sales.

Our studies of 10 years ago showed an annual load factor corresponding to 830 to 840 hours of the district demand. Our studies of the last two years show that the annual load factor is approximating a value of 1,000 hours' use of the district maximum. Please note that this is not annual use of the aggregate of the demand indicator readings of individual customers. That figure is quite different. For the 100 customers referred to it is virtually 700 hours. The diversity factor connecting district demand with the sum of the individual demands is therefore apparently 1.4 for such a group. The diversity factor connecting the demand of residence districts of any city with the general demand is presumably of a good value in every city, because of the late arrival of the hour of maximum demand.

Character of Business

Residence business is very stable. In hard times your customers may economize a little, but they do not order their lights disconnected. When, as in Detroit, the residence rate is differential, such economies are not perceptible. During the winter of 1907-1908 when our power sales were much reduced and our commercial-lighting sales were below expectation, our sales to residences showed no change. We have made the same observations during earlier periods of business depression. Collections from residence customers are prompt. Losses by bad debts are very small. The business is to a large extent self-propagating. If Mrs. Jones gets her house lighted by electric light, Mrs. Smith who visits Mrs. Jones makes inquiry at once as to wiring. If in a cottage district one man changes from kerosene to electricity, half a dozen of his neighbors are sure to make application for service within the next three months. Even as to flatirons, we find that if one woman who does her own housework acquires an electric iron, three or four of her neighbors will apply for irons on trial before two weeks have elapsed. As to the large and high-class residences, gas has ceased to be a competitor. Among the middle-class residences the great difficulty is the first cost of wiring, wherefore it is wise to encourage cheap wiring of houses when built. In Detroit we are now getting the cottage residences. This cottage business is literally taken from kerosene. The essential point seems to be that the cottage shall be occupied by its owner. Detroit has many districts of cottages, and of rows of small houses which we call terraces, where each cottage or apartment is owned outright or is being purchased on the installment plan by its occupant. Such householders prefer electric light, at an advanced cost over gas or kerosene, because of the saving in maintenance of wall paper and ceilings. There are several large property holders in Detroit who specify in their rental leases that electricity shall be used exclusively for lighting by their tenants. This policy has been adopted by them without action on the part of the company.

Residence lighting responds, as does any business, to a reduction of rates in the respect that a certain number of customers who previously did not think they could afford electric lighting will apply for service on the announcement of any given reduction, down to a certain point. Below that point the response will be less, because the rate is already low enough to bring the business. It is not necessary to meet competitive prices. As already pointed out, residents who own their houses will pay more for electricity than for gas. The advantages of a horizontal reduction in rate ceases when a point is reached where the cost of satisfactory electric lighting is 10 or 15 per cent. greater than the cost of gas lighting. The business does not respond to a horizontal reduction of rate, as do certain lines of commercial business, by a more lavish use. The prompt turning off of unnecessary lights is a pet economy of the good housekeeper, and no reduction in rate will induce her entirely to relinquish this particular bit of thrift. However, as the rate decreases and approximates the cost of gas or kerosene, she will allow the servants to use electric light and she will tolerate the continuous burning of porch and back stair lights.

Differential-rate Method

But the housekeeper will respond to a proper differential-rate method by using household conveniences, such as electric flatirons, fans, some cooking utensils, sewing-machine motors, washing machines, and a certain amount of electric heating. She will not use those things at a straight 10-cent or nine-cent or eight-cent rate. But if her electric-light bill is so framed as to give her the average rate which local competitive conditions require, by a differential billing which charges a low rate for current in excess of the absolutely necessary lighting, then she will use these conveniences. If her rate is eight cents per unit straight for an average of three hours' daily use of light and the same for all additional uses, she will not take to those additional uses. But if her rate for the three hours' service (or thereabouts) is 16 cents for the first hour and four cents for all additional service her instinct recognizes the bargain, and she is going to use flatirons and fans and curling tongs and chafing dishes and warming pads and as many other things, apparently appropriate to good housekeeping, as she thinks she can afford to buy. But householders will not stand for alterations of the wiring to provide separate circuits for these conveniences, even to obtain a low rate on a separate meter. To be conveniences they must be conveniently attachable anywhere throughout the house. Many housekeepers take much delight in doing in their own chambers the ironing of garments which they will not intrust to the tender mercies of their regular laundress. To have to go to the laundry would spoil the fun. If these desirable devices are to become part of the everyday equipment of the middle-class household a differential method which will automatically charge the proper low rate for this desirable business is absolutely essential.

The peculiarity of the Detroit rate lies in the method used to determine the amount to be charged monthly to each customer at the primary rate. The theory of the differential rate, as laid down by Dr. Hopkinson and Mr. Arthur Wright, requires that the fixed charge to be collected shall be proportional to the investment necessary to serve the customer. The Wright method of collecting the fixed charge proves to be more convenient than the Hopkinson method in dealing with all retail or non-contract customers, and residence customers naturally fall into that category. In planning a differential-rate method for such customers, a lighting company finds itself compelled to place the high or primary rate at a figure not exceeding the existing maximum rate. Logically, a rate higher than the existing maximum might be proper. Practically, any announcement of such a rate would be criticized as being a raise of price, and it is a fact that no company adopting the differential method of charging has placed the primary rate higher than its then existing maximum rate per kilowatt-hour. The Detroit company, recognizing this limitation, placed the primary rate at the same figure as its then maximum meter rate, namely, 16 cents.

There remained to be settled the question of how many units per month should be paid for by any customer at 16 cents before the secondary rate of five cents (later four cents) should become effective. It was simple to ascertain the proper fixed charge for an entire district, but thereafter to apply the rule requiring that each customer should pay a share of that fixed charge proportional to the investment required to serve him, was more complex. The Wright method, then in great vogue, would have prescribed that a demand indicator be installed on the premises of each residence customer and that the distribution of the fixed charge for the district be proportional to the readings of the respective indicators. There was the obvious alternative of making the distribution pro rata to the connected load of each customer. The method which was adopted in 1898 was to distribute the fixed charge of the district among the different residences pro rata to the number of rooms in each house.

The objection to the installation of demand indicators is not only the expense of instruments and of reading them, but that the indication given by those instruments bears no true relation to the investment necessary to serve each customer. The investment in a residential district is determined by the district maximum which comes at the hour of the evening meal. The ordinary maximum of each individual customer comes daily at the same hour. But the occasional maximum demand of the city-residence customer comes at the time when he entertains company on a large scale, and for a time turns on every light in the house. Now, according to the established custom of the American householder, such an entertainment is always later than the ordinary hour of the evening meal; and the guests whose presence calls for the extraordinary illumination are presumably occupants of other electrically lighted residences, and because they are not at home have for the time being ceased to use their share of the investment required by the district. We actually determined that the occasional complete illumination of one of our customers on the occasion of his giving a party was offset by lights turned off elsewhere in the district by his guests. Obviously, the demand recorded by an indicator would be that due to an entertainment, falling not only at an hour later than the district maximum, but compensated for by less demand elsewhere. Therefore, the demand indicator readings could not serve as an equitable rule for the distribution of fixed charge. They would cause the occasional entertainers to pay more than their share, while the people who never entertained would correspondingly pay less.

A similar objection lies against a distribution pro rata to connected load. Such a distribution would penalize convenience lights such as lights in closets, attics, basements and storerooms only occasionally used and for short periods. It would also penalize such devices as electric fans, flatirons and all kinds of decorative lighting and, by discouraging such connections, minimize the convenience which is one of the great advantages and best selling points of electric lighting in residences. It would overcharge the man who used electric light intelligently and would favor the man who installed the minimum number of lights. We noted particularly that it would discourage a practice which we were then trying to foster, namely, the wiring of servants' quarters for electric lights. The lighting of servants' quarters comes later than the district maximum and therefore tends to improve the load factor.

The method selected, namely, distribution pro rata to the number of rooms on the premises, is admitted to be empirical, but it proves to be not only equitable as between customers but to have several commercial advantages. One of these obviously is that the rating of premises can be reproduced at any time by simple inspection. It is also but seldom subject to change, and such changes as occur through the building of additional rooms or the internal alteration of large old houses are called to our attention by the request for additional service and lamps. Moreover, since from the very beginning we declined to consider in rating a house whether it was wired in part or throughout, the tendency of the method was to encourage complete wiring as distinguished from the wiring of company rooms such as the parlor and dining room, while the remainder of the house was left to gas or kerosene. We ascertained by many observations that the number of lights likely to be burning in any residence at the hour of district maximum was actually very closely proportional to the number of these living rooms.

Results in Detroit

Our residence business, as already indicated, responded promptly to a differential method which established on existing business a rate of about 11 cents in competition with good gas at $1 per thousand. The changing character of the business, as indicated by the improved load factor, and the reductions made from time to time in the number of units charged at the high rate, and by the change of the secondary rate from 5 cents to 4 cents, brought our residence rate last year down to an average of 6.8 cents. We think this was low enough, even in competition with good gas at 80 cents a thousand. A change of the primary rate from 16 cents to 14 cents per unit, made July 1, 1908, as part of an agreement with the city, will still further reduce the average rate. As far as getting business is concerned this latter reduction was unnecessary and we would have preferred to avoid it. At 6.8 cents average, we were getting the lighting of all the good residences in town, all of the new middle-class residences and many of the small residences which are not usually looked upon as possible electric-light customers. In one district having 3,000 houses, 2,517 are lighted with electricity. It must be remembered that our residence district is served by overhead wires and that therefore the investment cost is much smaller than is the case in cities where the distribution is underground. It should also be noted that in many blocks we light every house in the block, and that there is at present, in consequence of the low rate, a large amount of wiring of old residences going on so that we are filling up the vacant places in our circuits.

When these vacancies are filled even the present low rate will be justified. A rate of 20 cents or 25 cents per unit for service to a few scattered residences would obviously be unprofitable. An average rate of 6 cents per unit will be profitable when every residence in each block is served. The rapidity with which additional residences are being connected indicates progress toward that desirable end.

Advantages of the Differential Rate

We have noted in earlier paragraphs some of the advantages of a differential rate method as applied to residences. To realize all the advantages of the method there must be a considerable difference between the primary and secondary rates. It is well that the primary rate should be three or even four times the secondary rate. In most plants a rate schedule based upon the Wright analysis of costs will have this desirable characteristic; but in many cities the established maximum rate is so low that the secondary rate must be disproportionately high in order to make the necessary average earnings per unit sold. In changing from a straight rate to a differential rate it is desirable that the number of units to be paid for monthly at the maximum rate should be such that the householder using light with ordinary economy will have on every bill some units at the secondary or low rate, excepting only the midsummer bill. The appearance of the low rate on the bill puts the householder on inquiry, and when he realizes that he can double his use of current and yet only increase the bill by one-quarter or one-third, he quits the use of gas or kerosene and looks with favor upon use of current for purposes outside of lighting.

It must be obvious that if doubling the use of current only increases the bill by 25 percent. or 33 per cent., there will be a reduction of complaints about large winter bills. We have never had a complaint from a residence customer about high average rate for summer bills and the first application of the differential rate was followed by a remarkable reduction in the complaints as to big winter bills.

In a preceding paragraph we pointed out the advantage of a differential rate in that it automatically makes the proper rate for miscellaneous heating and small power services. To this we have to add that there are considerable possibilities in the small power service.

Residence Metering

There is a relation worth noting between the differential rate method and meter efficiency, namely, that the cost of meter slip is minimized. A residence meter must not burn out when all the lights are turned on, but the ordinary load is one-fourth or one-fifth of all the light, and in many houses one or two lights of low candlepower burn all night. A meter is required having the incompatible qualities of great overload capacity and accuracy at very light loads. In Detroit on our alternating circuits we use as a compromise of these requirements the earlier type K, Fort Wayne 10-ampere meter—not the later high-efficiency type. This meter is correct with one 16-candlepower lamp and is quite safe, although slow, with 100 per cent. overload, which overload represents the turning on of all the lights in an ordinary 10 or 12-room residence. On such an overload the high-efficiency meter would burn out. Obviously such a meter, staying in service two or three years without adjustment, fails to account for some current used at very light loads or during the occasional overloads. But this unmetered current is current which, under the operation of the differential rate, would be charged for at the minimum rate, so that the loss by meter slip is a minimum, and a minimum expense for meters (both in first cost and maintenance) is justified. This is important in residence lighting as with all small-customer business. Even now the cost of metering is too large an item in the investment necessary to serve the small-residence customer and, in order to take the business of still smaller residences, now offered to us, we must find some way to reduce the present meter expense. In this light it is clear that separate metering for service other than light is not desirable nor practicable.

Our conclusions are as follows:

Residence lighting has an annual load factor, now 1,000 hours, and improving; a ratio, approximately 1.4 to 4, for the sum of the individual monthly demand indicator readings of a group of 100 or more residences against the combined demand of the group—that is to say, a diversity factor of 1.4; a high diversity factor against office buildings, wholesale houses and factory lighting, coming later in the evening than these classes of service.

Residence lighting is not subject to any competition in large and expensive residences; will carry a price of 10 per cent. to 20 per cent. higher than gas in medium residences, and is a competitor with gas and kerosene for the lighting of very small residences occupied by their owners.

Residence lighting is desirable business when the distribution investment can be minimized by overhead construction; by comparatively cheap meters, and by the operation of a rate schedule which secures sufficient density of service—that is to say, a sufficient number of customers in each block supplied.

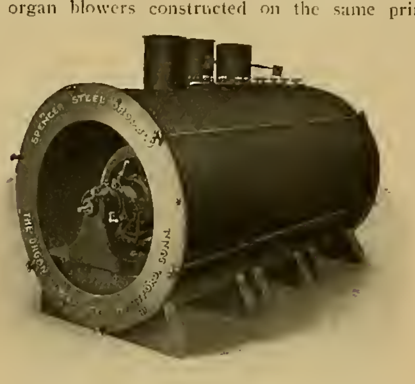
Residence lighting rates should encourage the use of all electric appliances adapted to residential use without requiring separate metering of current for such appliances.

Parlor-car trains running from Evanston, Ill., to Milwaukee in two hours and a half are promised by the receivers of the Chicago and Milwaukee Electric for November 1st. The line now is being operated from Racine to the Milwaukee limits for freight service. The parlor cars for the Chicago-Milwaukee service already have been ordered and the cars on hand have demonstrated their capacity to run at the high speed necessary to make the two-hour-and-a-half schedule. There is no doubt that within a few weeks a steam road is to have its first severe competition in the middle West from an electrically operated line, as the road from Racine northward parallels both the Northwestern and the Milwaukee and St. Paul. The construction of the new line has cost about $800,000.

ORGAN BLOWING BY ELECTRIC POWER

One of the earliest applications of the electric motor was the driving of organ blowers. As all these blowers were formerly of the bellows type, the simplest method of using the motor was to cause it to drive a crank which operated a slotted arm attached to the bellows. This scheme was satisfactory so far as obtaining a current of air was concerned, but usually resulted in considerable noise. In spite of this defect, however, there are still a large number of small organs so equipped.

During the last few years there have come into use organ blowers constructed on the same prin-



ELECTRIC ORGAN BLOWER

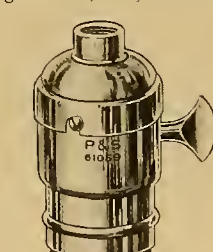
ciples as centrifugal blowers used for ventilation. The continuous rotary motion of the electric motor has not only made their use possible, but has made them the preferable type for this kind of drive. The accompanying illustration shows one of these blowers of large size driven by a motor, and built by the Crocker-Wheeler Company of Ampere, N. J. This blower in addition to being of the fan type is so constructed as to be noiseless, even when run at high pressure. There are no bearings except those of the motor itself, which results in a considerable saving of power. No rheostat or other device for regulating current is required, which results in additional saving, as the air supply and current consumption are regulated automatically by the amount of air required by the organ at any moment.

For high pressures a multi-stage or compound blower is used, which is so built that there is no interruption to the continuous motion of the air in passing from one stage to the next. This not only effects a saving in power, but reduces to a considerable extent the heating of the air. The blower is entirely of steel. Crocker-Wheeler motors are used for blowers of all sizes. On the smaller sizes the motor is placed outside of the blower, but the same principle of mounting the fan on the motor bearings is carried out.

TWO NEW SPECIALTIES

In the accompanying illustrations are shown two novel devices for which there has been some demand in wiring work. What is known as a feed-through switch gets its name from the fact that the cord passes through the switch. The uses for such a switch are many, as oftentimes in certain wiring work, such as for small sewing-machine motors, stereopticons, heating devices, etc., it is de-

FEED-THROUGH SWITCH



METAL-KEY LAMP SOCKET

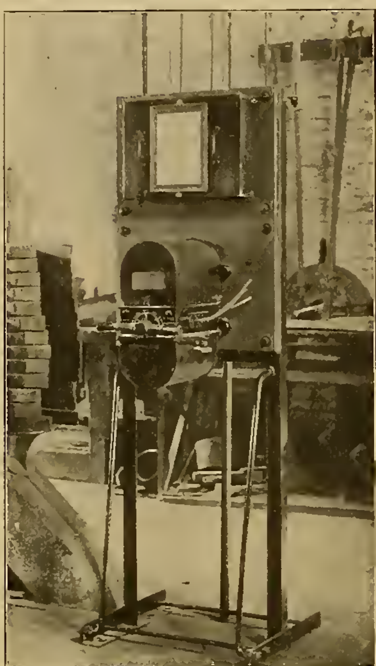
sirable to cut a switch into the cord instead of placing the switch at the end of the cord or using a wall switch. This device is wired up by simply passing the cord into the upper bushing connecting one wire to terminals and passing the cord out through lower bushing. Only one wire is cut, the other passing right through.

The lamp socket shown is distinctive because it has an entirely metallic key. This particular type of socket is the only one in which this can be accomplished, as the design is of such a nature that the mandrel is at all times "dead." The demand for this socket comes principally from the manufacturers of fixtures, portables and the like, who wish a socket with a key to match the finish of the fixture. All brass-shell sockets and receptacles of this type may be equipped with this metal key.

These devices are manufactured by Pass & Seymour, Inc., Solvay, N. Y.

MOUNTING OF POTENTIAL STARTERS FOR INDUCTION MOTORS

In the accompanying illustration is shown a novel and convenient method of placing potential starters. All such starters in the plant of the Portland Company, Portland, Me., are mounted on vertical supports instead of on a wall or post, as is the usual



POTENTIAL-STARTER PANEL FOR INDUCTION MOTOR

practice. Lack of available wall space induced the company to arrange its starters in this manner, which allows the apparatus to be placed anywhere and changed as often as found necessary without marring the appearance of a wall or taking apart the entire starting board. The supports are of angle-iron framework, to which are bolted two pieces of slate, serving as a mount. Slate barriers are provided between the fuses. A sheet-iron cover, so arranged that it can be taken off without trouble, is placed directly over the fuses. On the outside of this cover is fastened a framed card containing directions for operating and size of fuses to use. The starters are used in connection with Allis-Chalmers induction motors, 15 of which have been installed in this plant.

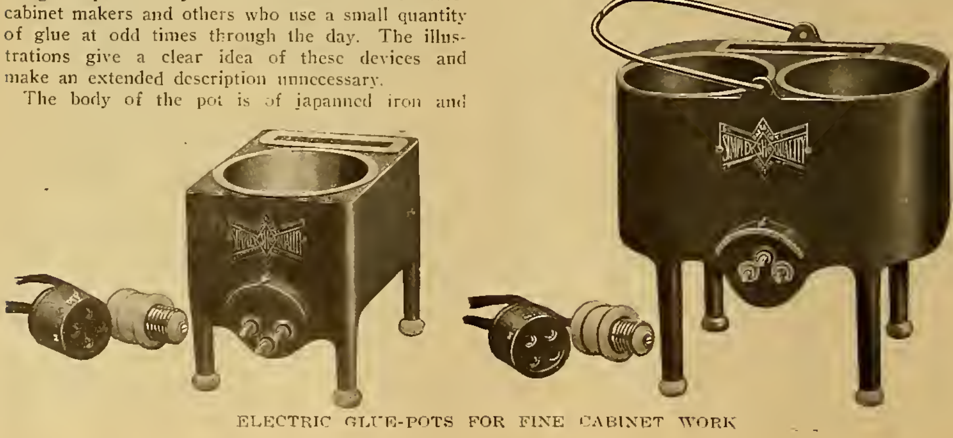
ELECTRIC GLUE-POTS FOR FINE CABINET WORK

A new type of electric glue-pot has been recently put on the market by the Simplex Electric Heating Company, Cambridge, Mass. It is called the piano-factory type, from the fact that it is designed particularly to meet the needs of fine-cabinet makers and others who use a small quantity of glue at odd times through the day. The illustrations give a clear idea of these devices and make an extended description unnecessary.

The body of the pot is of japanned iron and has the electric heater attached permanently to the bottom. The glue cup, which contains half a pint, is made of spun copper without a seam and is removable for cleaning. When in place it is immersed in the water bath contained in the iron pot. The small receptacle for hot water to keep the brushes in, is also of copper.

The larger size pot has two cups for thick and thin glue, containing one pint each, as well as a receptacle for the brushes. Each size is mounted on iron legs with porcelain feet and supplied with six feet of cord and a lamp-socket plug. The cord is attached at the glue-pot by means of another plug, which gives three changes of heat—high, medium and low.

These glue-pots are economical in the use of current and can be operated cheaply for long periods of time, when the lowest heat only is used to keep the glue warm. For factory use they eliminate the danger of fire, promote cleanliness, and save time for the workman, as they can be used directly at his bench. For home use they are most convenient.

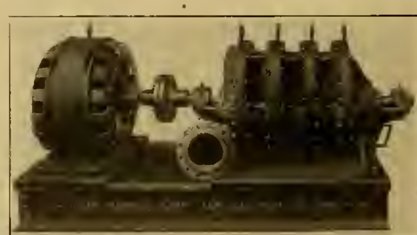


ELECTRIC GLUE-POTS FOR FINE CABINET WORK

A MOTOR-DRIVEN CENTRIFUGAL PUMP

An application of the electric motor to pumping duty is shown in the accompanying half-tone reproduction of an induction motor direct-connected to a Lea-Degen 10-inch four-stage turbine-pump having a capacity of 2,400 gallons per minute delivered against a 568-foot head. The line of pumps is designed for heads of from 7 to 1,000 feet and capacities ranging from 75 to 30,000 gallons per minute.

One of the features of this type of centrifugal pumps is its construction in separable units and parted both horizontally and vertically so that it is possible to assemble quickly any number of stages required. After these sections are bolted together the top can be easily removed, allowing inspection of packing and wheels. Both suction and discharge are placed below the center line of



TURBINE PUMP DIRECT-CONNECTED TO INDUCTION MOTOR

the pump, allowing removal of the top without breaking the water connections.

By the Lea-Degen patented diffusing nozzle deflectors it is possible to get extremely high efficiency throughout a large range of service. A series of tests was carried out at Trenton, N. J., by Prof. James E. Denton of Stevens Institute of Technology on a 10-inch two-stage motor-driven pump designed to deliver 3,000 gallons per minute against a head of 100 feet, running at 600 revolutions per minute.

The pump was driven by a General Electric direct-current multipolar dynamo of 385 amperes and 220 volts capacity, used as a motor, and directly connected to the pump shaft. The pump was arranged to lift water by suction about seven feet from a well fed from the Raritan Canal and to deliver it through a 6½-inch bell-shaped nozzle to a weir tank.

The tests showed that the pump afforded the following results under conditions of maximum efficiency.

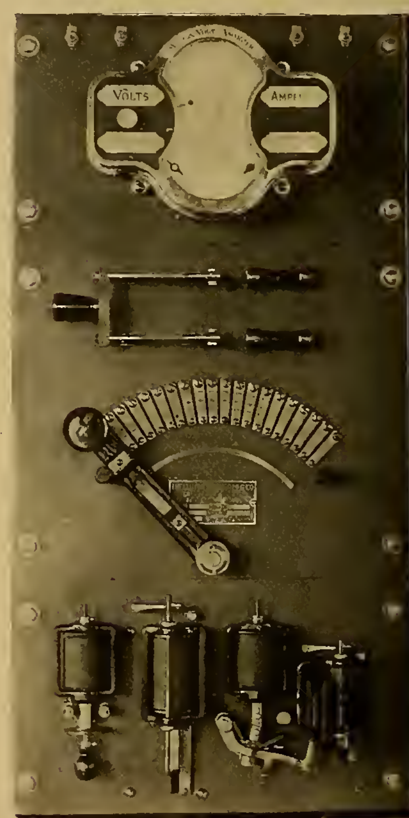
At 400 revs. 77.7% eff. with a cap. of 2,296 gals. under 43.6 ft. lift
At 500 revs. 77.6% eff. with a cap of 2,794 gals. under 67.4 ft. lift
At 600 revs. 77.97% eff. with a cap of 3,235 gals. under 100.7 ft. lift

In round numbers, therefore, the capacity at maximum efficiency is directly proportional to the revolutions, and the lift, or head, is proportional to the square of the revolutions. At each speed the efficiency averaged more than 76 per cent. over a range of 600 gallons of capacity for the lower two speeds and 900 gallons at the higher speed, the head remaining nearly constant.

These pumps are manufactured by the Lea Equipment Company, 136 Liberty Street, New York city.

BATTERY-CHARGING PANEL

The demand for a battery-charging rheostat to meet not only all requirements of battery-charging service, but which should possess automatic protective features as well, has led the Cutler-Hammer Manufacturing Company of Milwaukee to place on the market the panel herewith illustrated. The



1 2 3 4

BATTERY-CHARGING PANEL

rheostat consists of a slate front mounted on an angle-iron frame and supporting the resistance, the whole being designed for attachment to a wall or switchboard.

The panel, which carries all of the operating mechanism, consists of three separate pieces of slate. On the face of the one uppermost are mounted the battery-circuit terminals and a Weston volt-ammeter. The middle slate carries a double-pole knife switch and fuses, and below these the contact segments and operating lever, by means of which the charging current is regulated. On the bottom section of the panel are mounted the automatic protective devices, which are:

(1) A low-current cut-out which automatically opens the circuit if the current drops to a predetermined minimum. This prevents the battery from discharging into the line should the line voltage drop below that of the battery.

(2) A maximum voltage cut-out. This automatically opens the circuit when the battery voltage reaches the point at which the cut-out is set to operate.

(3) A solenoid switch, the opening or closing of which breaks or makes the main-line charging circuit.

(4) An overload circuit-breaker which automatically opens the circuit if the charging current rises to the point at which the breaker is set to operate.

This insures the battery against being charged at an excessive rate.

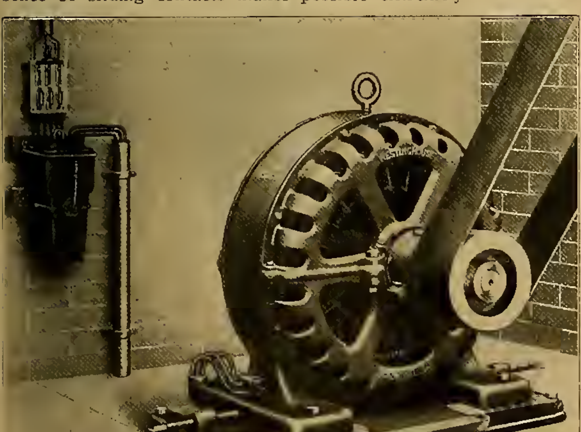
The operation of this type of battery-charging set is as follows: After the battery and line connections have been made, the operator first closes the knife switch and then moves the operating lever forward to the third contact segment, at the same time raising the plunger on the low-current cutout (1), thus energizing the solenoid switch (3), which closes and permits the charging current to flow to the battery through the resistances. If at the beginning the charge the operating lever is not in the starting position, it must first be brought to the starting position and then moved to the third contact segment as described above. It may then be moved further and further to the right, cutting out one step of resistance after another and increasing the amount of current until the desired value is obtained.

Should the current fail, or reverse, the low-current cut-out (1) will release its plunger, thus de-energizing the solenoid switch (3), which will in turn open the main circuit. Should the charging current reach the point at which the overload circuit-breaker (4) is set to operate, this will open the main circuit. Finally, when the charge is continued until the battery reaches the voltage at which the maximum voltage cut-out (2) is set to operate, this will automatically open the circuit, thus insuring the battery against an overcharge.

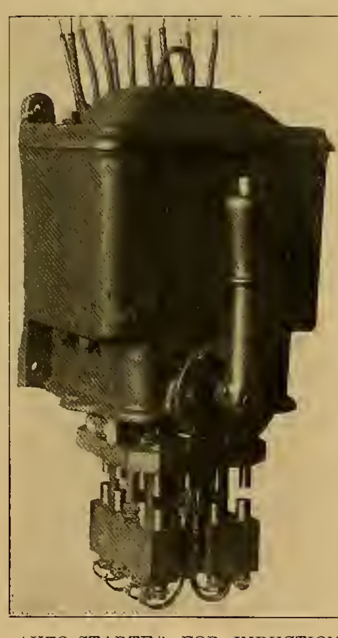
It is evident that the use of this panel protects the battery under all charging conditions, as it not only guards against an excessive charging current, but also prevents the battery discharging back into the line should the line voltage fall below the voltage of the battery. It possesses, moreover, the advantage of requiring no attention after the charge is once begun, since the maximum-voltage cut-out (2) will cut off the current of itself when the battery is fully charged. As an additional protection, the operating lever is provided with an electrical interlock, which prevents the operator from closing the circuit to the battery except when the lever is in the "off" position, that is, with all resistance in circuit. These battery-charging sets are made at the New York works of the Cutler-Hammer Manufacturing Company, One-hundred-and-thirtieth Street and Park Avenue, New York city.

WESTINGHOUSE INDUCTION MOTORS AND STARTERS

Polyphase induction motors of the squirrel-cage type offer advantages for many installations superior to those of any other type of motor. The absence of sliding contacts makes possible extremely simple construction with no wearing parts except the bearings. Freedom from sparking is assured; these motors can be used with safety in locations surrounded by inflammable or explosive material. The line connections are made to the stationary element when the motor is installed and no further connections are necessary. The rotating element is practically indestructible. Simplicity of construction and operation and low cost for attendance and maintenance are among the marked advantages of this type of motor.



POLYPHASE INDUCTION MOTOR WITH AUTO-STARTER



AUTO-STARTER FOR INDUCTION MOTOR, WITH OIL TANK REMOVED

Having been a pioneer in the field of alternating-current motor production, the Westinghouse Electric and Manufacturing Company thinks it is entitled to belief in asserting that its type CCL polyphase induction motor possesses all the advantages inherent in this type. It is characterized by great strength of parts, large self-oiling bearings that seldom require attention, high-starting and pull-out torque, large overload capacity, low-operating temperature, practically constant speed and high efficiency and power factor.

Type CCL motors are built in all commercial sizes from one-half horsepower up to several thousand horsepower. The smaller sizes are built for 100, 200, 400 and 550 volts; motors of 30 horsepower and larger are built also for 1,000-1,100 and 2,000-2,200 volts. The motor can be arranged for belted, geared or direct-connected operation with a horizontal or a vertical shaft. The horizontal-shaft motor can be equipped with back gears and a countershaft.

In the CCL motor the stator, or stationary primary, consists of a frame with two removable bearing brackets and bearings and a core which carries the windings. The rotor, or rotating secondary, consists of a core with conductors, a spider and shaft. For some of the larger sizes of stator coils copper strap or bar is used instead of wire, and for most of the high-voltage motors formed coils are laid in open slots. The rotor windings of all except the smallest frame consist of insulated copper bars securely fastened to cast-metal end rings by copper-plated iron machine screws. The windings of the smallest size consist of insulated round copper rods riveted to the core end plates, which are also of copper.

In order to supply a convenient method of driving certain types of machines, such as vertical shaft centrifugal pumps, a modified form of the type CCL motor is arranged for operation with the shaft vertical. The electrical design and characteristics are identical with those of the horizontal form. The ball-thrust bearing carried by the upper bracket is capable of carrying something additional to the weight of the rotor. The weight is supported by balls rolling in a raceway between hardened steel disks.

In starting an induction motor with full primary voltage the rapid motion of the field magnetism relative to the rotor conductors causes a large current in the motor secondary and a correspondingly large primary current. This causes a large starting torque, varying in the type CCL motors from approximately one and one-half to two and one-fourth times the full-load torque, or that necessary to give the rated output at full speed. In most applications, however, especially where motors and lamps are supplied by the same circuit or transformer, large starting currents are objectionable because of the resulting disturbance to the line voltage. Each type CCL motor larger than five horsepower is provided with a device for reducing the voltage applied to the motor primary in starting. This device consists of two auto-transformers and an oil-immersed switch for changing the connections and is called an auto-starter. All the parts are enclosed in a dustproof cast-iron case. If required by the starting conditions the selection of points and the switching device can be so made that the voltage is applied to the motor in several gradually increasing steps, constituting a multipoint auto-starter; but for most purposes two starting points are found to be sufficient.

The switch contacts consist of copper rods abutting against brass rods, the movement in closing or opening being vertical. This combination of metals has proved very satisfactory in resisting injury from arcing. In closing the switch, coiled springs around the contact rods are compressed.

A locking device holds the lever securely in the off position and in the running position until released by pressing the thumb-piece in the end of the handle. The handle will not remain in the starting position unless held there by the operator, and on being released returns at once to the off position. A mechanical device prevents moving the handle directly from off position to running position; it must first be moved to the starting position, the extreme left, and then moved quickly back past the off position to the running position at the extreme right. If this last movement is slow the handle will be caught and held in the off position.

In special cases, where CCL motors are required to start heavy inertia loads, more than two starting points may be advisable and multipoint auto-starters can be supplied.

For motors up to 50-horsepower driving pumps or air compressors, automatic multipoint auto-starters can be furnished equipped with an operating head, which is actuated by the rise and fall of a liquid level or by the change of pressure in a closed tank system.

These types of motors have had a wide range of application in almost every industry.

LOW-VOLTAGE ELECTRIC RESISTANCE FURNACE

A new type of electric resistance furnace, as illustrated herewith, has been designed for quick heating up to temperatures of 1,200° C. or 2,000° F.

LOW-VOLTAGE ELECTRIC RESISTANCE FURNACE

It is used on alternating-current circuits only with a special transformer giving a low secondary voltage. This transformer is so designed that the furnace temperature is controlled by changing a plug on the transformer to give either six, eight or 10 volts. In this manner the temperature is easily regulated and only enough current is used to produce the heat required, thus doing away with a rheostat control, with its waste of energy.

The principal feature of this furnace, compared with other wire-resistance furnaces, is the direct application of the heat to the substance to be heated. This is made possible by the use in the furnace of the very low voltage referred to, which also prevents destructive short-circuiting in case a metallic article is put into the furnace directly in contact with the wire of the heating unit. The wire used is of relatively large section, about one-eighth inch square. Another important feature of this type of furnace is that the heating units can be replaced by the operator, by simply loosening two screws.

In resistance furnaces, such as are usually made for standard 110 or 220 voltages, in which the heat must penetrate a refractory substance like fire clay, it necessarily follows that the temperature of the wire is about 200 degrees hotter than the interior of the furnace. This decreases the durability and also reduces the speed of heating. The furnace above described and shown in the illustration has 10 crucible openings, large enough to take a 15-cubic-centimeter platinum crucible. It is in use in the laboratory of a large cement plant and is giving excellent satisfaction. It is of robust construction and guaranteed for durability.

These furnaces are known as Type 50 and are manufactured by the Hoskins Company, 93 Erie Street, Chicago.

LOW-PRESSURE STEAM TURBINES INVESTIGATED

The Cambridge (Mass.) Electric Light Company recently retained Prof. I. N. Hollis of Harvard University to report upon the advisability of installing a low-pressure steam-turbine equipment in the company's plant on the Charles River. Professor Hollis' findings were favorable to the installation, and are given below in their essential features.

There are at present in the station four reciprocating engines—two of 500 kilowatts, one of 1,500 kilowatts and one of 1,200 kilowatts—all of the McIntosh & Seymour make. They are designed to run with a temporary overload of 50 per cent., making a possible normal output of 4,500 kilowatts, or, for a short time, 6,750 kilowatts. Steam is taken from the boilers at a pressure of 145 pounds, and it exhausts into ordinary jet condensers after having passed through a closed heater. The condensed steam and the circulating water are removed from the condenser by the ordinary bucket air pump.

The proposition is to run the engines on 15 pounds back pressure, and to utilize this back pressure in driving a low-pressure turbine. As the engines now in use in the plant are compound, this would amount to making each unit a triple-expansion engine whose third cylinder would be replaced by a turbine. Professor Hollis says that the combination is practical and would not present mechanical difficulties either in construction or operation.

In order to determine the possible economy of the above combination, one of the 500-kilowatt units was run with three back pressures—first, with as great a vacuum as was possible by speeding up the air pump; second, with a moderate vacuum, and third, with atmospheric exhaust. It was not possible to weigh the feed water used under these different conditions, but there was enough material from a test made several years ago in connection with the indicator cards taken in the recent test to determine within a very small per cent. of error the amount of steam used per indicated horsepower-hour. A combined card was made in the third case to ascertain the amount of energy available for the low-pressure turbine.

During the run the exhaust steam from the air pump and feed pump were carefully weighed in order to determine the expenditure for auxiliaries. The results are tabulated as follows:

Back pressure, lbs. per sq. inch absolute	1.5	3.3	16
Indicated borsepower	803	836	1,001
Kilowatts at switchboard	540	563	673
Pounds steam per h. p. hour (indicated)	13.21	14.10	21.58
Pounds steam per k. w. hour at switchboard	19.64	20.96	32.07
Pounds steam per ind. h. p. hour including air and feed pump	14.97	14.96	21.94
Pounds steam per k. w. hour, including air and feed pump	22.26	22.24	32.60

It will be noted that the greatest vacuum corresponds with the lowest output, seemingly a paradox, but in this case the cut-off responded to the greater demand for steam, and consequently the power was increased in proportion to the demand at the switchboard. The load was purposely increased during the run on atmospheric exhaust, in order to show that it was entirely possible to run the engine with an overload. The result showed that there is no gain by increasing the vacuum beyond 23 or 24 inches with the present arrangement in the station, as the amount of steam used by the auxiliaries offsets the gain in the engine.

The steam per kilowatt-hour includes not only the consumption of the main engine, but also the steam used on the auxiliaries, and is practically the total outlay of steam for the station for the three sets of conditions. The maximum power was obtained without readjustment of valves for smooth running. During the test of the engine a noisy operation of bearings and low-pressure cylinder was noted, which could have been removed if time was taken to adjust the valves to operate on atmospheric exhaust. It was not advisable to stop the engine for this purpose, however, and the test represents only the possible power, with a close approximation to the amount of steam expended.

The test showed that 673 kilowatts is obtained on 32.07 pounds of steam per kilowatt-hour, excluding auxiliaries. A combined card was calculated in order to obtain the amount of power available for a low-pressure steam turbine, and the result was 1,069 horsepower, to be added to the 1,001 horsepower developed in the cylinders. The output with a steam turbine would then be 1,392 kilowatts, as against the normal output of 500 kilowatts for which the engine was designed. The total output of the station could therefore be doubled with ease by simply adding two or three low-pressure turbines.

Regarding the actual expenditure of steam per horsepower with the exhaust turbine added, there will be no further consumption for the total power than was expended in the main engine exhausting into the atmosphere. This amount would be 15.51 per kilowatt, exclusive of auxiliaries, or 16.77 pounds with the latter. The allowance for auxiliaries is the maximum of what was obtained on the run for a vacuum of 27 inches. The amount of steam expended for the 500-kilowatt engines as now running is 22.24 pounds, including auxiliaries. The net saving would then be 5.47 pounds per kilowatt-hour, or a gain of 24.6 per cent. in economy. With this gain in economy the station's output could be increased from about 4,500 kilowatts to 6,000 kilowatts without the expenditure of a dollar for additional boilers or coal, and the doubling of the station capacity could be attained with an increase of but 50 per cent. in the boiler capacity.

The cost of current during the last year was 2.75 cents per kilowatt-hour at the switchboard. Of this 0.69 cent went into coal, and the percentage saving above would be simply on coal, amounting to a saving of 0.17 cent at the switchboard per kilowatt-hour, and reducing the cost to 2.58 cents. The cost of water would probably be reduced; the cost of wages would not necessarily change; and the repairs to the station would probably increase, though this would depend upon the type of condensing apparatus used.

Interest on the new plant would also increase the expenditure somewhat. The first cost would be about $25,000 for turbine, pumps and condensing apparatus. Interest was figured at $1,250. The yearly saving in coal at 0.17 cent per kilowatt-hour amounts to about $10,220, making a net saving per year of $8,970, unless unforeseen complications should arise. Professor Hollis advised, in a preliminary way, the use of a Bulkeley jet condenser with a centrifugal turbine-operated injection pump and a dry-air pump to secure as nearly as possible 28 inches of vacuum.

The Cambridge company has recently installed a 2,000-kilowatt compound engine which represents a reserve in case of emergency. If the company favors the early addition of a steam turbine run on exhaust steam the recommendation is to install a 1,200-kilowatt unit to utilize the exhaust from either or both of the 500-kilowatt engine units. There is room in the station for this equipment, but the type of condensing apparatus best adapted to the conditions deserves further study. With the exhaust turbine one 500-kilowatt unit would handle the daily load, and two 500-kilowatt units, with the turbine, would take care of the maximum load. There would probably be some saving, due to the number of boilers required for the load, and the loss from radiation and leakage would be materially decreased.

TAKING A TIMBER CENSUS

The National Conservation Commission has caused to be undertaken the first comprehensive attempt at a census of the standing timber in the United States. A trained man can with great accuracy "cruise" a tract of forest and estimate the number of board feet it contains. Large portions of the forests of the country, including practically all the national forests, have been estimated at various times, but no organized effort has ever been made to gather them into one total, nor to supply the deficiencies where hitherto no estimates have been made. As a result, the guesses as to the amount of standing timber in the United States range all the way from 822,682 million to 2,000 billion board feet.

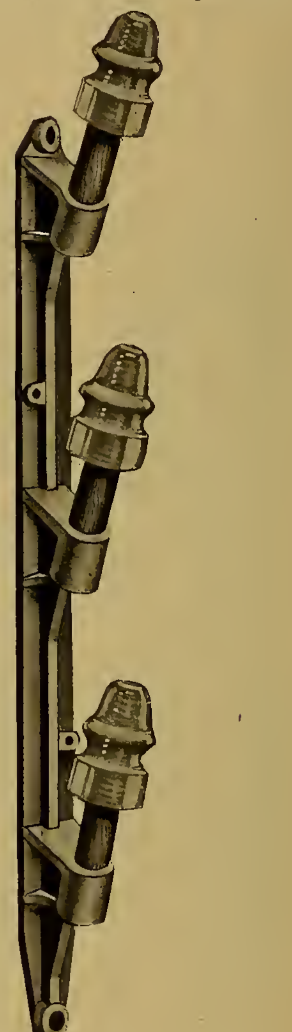
The commission is undertaking the work by means of a tremendous amount of correspondence. In all nearly 150,000 letters have been sent. These letters also ask for a wide variety of information besides the area and capacity of forests. They touch upon all phases, not only of the lumbering and milling industries, but of all others which are even indirectly dependent upon the use of wood. The purpose of the commission is not merely to learn how much wood is growing now, but how long it may be expected to last and how the supply may be prolonged by economy.

During the present year about 2,500 acres of forests have been planted in the six New England states by private citizens. In addition, a number of water companies have adopted a forest policy. The largest plantation of this character, which comprises over 1,000 acres, belongs to the Metropolitan Water and Sewerage Board of Clinton, Mass.

One of the most important phases of reforestation in New England is that of planting abandoned farms and other waste land which at present is bringing no income. White pine is, of course, the species most generally planted, but other species which make excellent growth and are being used more and more are Norway spruce, for timber and pulpwood; chestnut, for telegraph poles, posts, ties and lumber; red oak, for piles and ties; black locust, for fence posts, and sugar maple for a variety of products.

INCLINED-PIN WALL BRACKET

There has recently been placed on the market by the Central Electric Company of Chicago the Derby wall bracket shown in the accompanying illustration. By the construction adopted the insulator pins are given a slant instead of being placed in a vertical position or parallel with the bracket as has been common in the past. This arrangement brings the wires farther from the building, thus materially increasing the insulating distance.



DERBY WALL BRACKET

The mechanical construction is such and the parts are so proportioned as to give the greatest strength to resist bending of the base plate, a very important feature in this class of work. By the use of wooden pins the insulation factor is a maximum, owing to the fact that since moisture is liable to gather, if an iron pin is used the path from the wire to the ground is much shorter than afforded with a wooden pin. This bracket is being used by some large transmission companies and after being thoroughly tried out has been adopted as a standard. It will be readily seen that various modifications in its design are possible, such as for two, four or more pins.

The August report of the Municipal Street Railway Company of Cleveland, Ohio, shows a profit for the month in the operation of the road of $5,404.34. Gross earnings for the month were $427,656.96.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, September 24.—The French Academy of Sciences has received a large legacy from its former permanent secretary, the late E. Becquerel. At a recent meeting of the Academy, his son, Mr. Jean Becquerel, announced that the legacy amounted to $20,000, and was left to that body in order to found a number of prizes or to otherwise encourage scientific work. The value and destination of the prizes were left to the decision of the Academy.

Geneva was plunged in darkness on the 14th of September, owing to a short-circuit at the electric-lighting station. A mouse was found to be the cause of the trouble. The lights went out shortly after nine o'clock, and the accident was especially annoying in the Casino, the theater and the principal cafés and restaurants, as well as the newspaper offices. Some of the establishments could use gas, but the remainder were reduced to the use of candles. Unlike the similar disturbance which occurred at Paris, the present one was not due to a strike, as was first supposed, but was owing to a short-circuit in the hydraulic plant of Chèvres, on the Rhone, near the city. The cause of the extinction of 166,000 lamps was a small mouse, whose carbonized body was found at the point of the short-circuit.

The porcelain insulators which have heretofore been used on the telegraph lines in France are being replaced by glass insulators, especially in the suburbs of Paris. The new form is of green glass. It is said that these will be cheaper than the porcelain insulators, but, on the other hand, they are more easily broken, so that it is not certain whether the administration will find the change to be an advantage.

A radio-telegraphic post is soon to be installed by the French government at Ajaccio, Corsica, for military purposes, especially for the marine. Work will be commenced on the new station as soon as the contract has been awarded, and it will be placed at the center of the gulf upon the point of Aspreto, which is near the anchoring place of the torpedo boats. The Aspreto point commands the whole of the gulf, and it is protected by recently erected batteries.

The postal and telegraph building of Grenoble was partly destroyed by fire on the 7th of September, owing to a short-circuit caused by a telephone wire falling upon the lines of the Grenoble-Vizille tramways. Telegraph and telephone connection was cut off between that city and Lyons and Marseilles, but was re-established within a few hours. The local telephone circuits also suffered from the fire.

It is proposed to use electric traction upon one of the important railroad lines in Turkey, the Hedjaz line. Waterpower will be utilized, and the electric trains will be run at first upon several sections of the railroad.

The municipality of Cologne is soon to advertise for bids relating to the required equipment for the increase of the city lighting and power station. This will include four steam turbines of 3,000 horsepower each, with their accessories. It is estimated that the total cost of the increase will reach $500,000.

Among the new electric-traction enterprises in Austria, I may mention the proposed traction line running from the town of Hötting, in the Innsbrück region. The minister of railroads is considering the project for a 10-mile line of narrow-gauge road, to be constructed between Hötting to Halli by way of Mühlau. Another proposed line is to run from the town of Görz to suburban localities, using 25-horsepower cars.

Caissons are now being sunk in the Seine in the western part of Paris for the new section of Metropolitan subway which is to run from Auteuil to Place du Danube. The line will run in a general east-west direction across town. A. DE C.

GREAT BRITAIN

London, September 25.—A week today the much-discussed electrical exhibition will be opened to the public, although the official opening will not take place until October 5th, when the mayor of Manchester will be present. There will be over 300 exhibitors, just about double the number in 1905. It may surprise some people to know that the temporary building in which the exhibition will be held is constructed entirely of wood. The dimensions of the building are 500 feet long by 150 feet wide.

Mr. C. H. Merz, consulting engineer for the Melbourne suburban electric-railway project, has sent in a voluminous report in which he recommends the adoption of a direct-current system of 800 volts and the third rail, but with an under-running conductor. This will involve the construction of a power house at Yarraville, of a total capacity of 35,000 horsepower, steam-turbine generating sets being installed. The scheme, if carried out according to Mr. Merz's ideas, will be developed in three stages at a total capital expenditure of about $10,000,000, and doubtless when the tenders for the necessary plant are called for, there will be some keen competition from all parts of the world.

Following the example set by the tramways committee at Dundee, the Manchester corporation tramways committee will recommend the use of trolley omnibuses in certain outlying thoroughfares, and it is not improbable that the corporation will seek the necessary parliamentary powers next session.

The time for the consideration of the London electric power bills is fast approaching, but, judging from the large number of petitions which are being presented against them in the second house, it would not appear that the promoters have made much headway in bringing the existing authorities round to their viewpoint. There are at present all the signs of another protracted inquiry before the House of Commons committee, but as the government has, in effect, given the bills its blessing, they ought to be passed.

A new government post of electrical inspector of mines has been created, and Mr. R. Nelson, a member of the staff of Mr. Merz, has been appointed to it. G.

EASTERN CANADA

Ottawa, October 3.—Well within the estimate of $1,170,000, are the five tenders which have been received by the Ontario Hydro-electric Commission for the electrical equipment of the 12 transformer stations. The tenders, in addition to the electrical equipment, include the station at Niagara Falls.

The aggregate gross earnings of the Ontario Electrical Development Company to date amount to $374,189, an increase of $173,544 over last year, while the net receipts at $295,706, reveal an increase of $174,297 over the corresponding period ended September 1, 1907.

The financial year of the Montreal Street Railway closed on the last day of September, and it is estimated that the system will show gross earnings of about $3,620,000, against $3,503,643 last year. It is yet too early to give an estimate of the net earnings with any degree of accuracy, but it is believed that the road will exhibit a surplus of at least $25,000 over and above the $900,000 required for dividends. The gross earnings of this road seven years ago were $1,900,680. W.

NEW YORK

New York City, October 3.—The Public Service Commission's first series of car-fender and wheel-guard tests, which began at Schenectady on September 15th, came to an end today. Thirty-five devices were tested in that time on the grounds of the General Electric Company. The commission's electrical engineer, A. W. McLimont, who was present at the tests, returned to this city yesterday, and said he considered that important results had been achieved. A second series of tests for the benefit of the western manufacturers is to be held at Pittsburg on the grounds of the Westinghouse Electric Company, beginning October 20th. During the two weeks at Schenectady not less than 962 separate tests were made. Two trolley cars, one double-truck and one single-truck, were used. The total distance registered by the speedometers during the tests was 148 miles—an average of about one-sixth of a mile for the round trip of each test.

William J. Wilgus, former vice-president and chief engineer for the New York Central, has resigned as consulting engineer for the Public Service Commission. He was retained to assist the commission in solving the Eleventh Avenue track-removal problem. He had already made a preliminary report to Commissioner Bassett. Mr. Wilgus has become president of the Amsterdam Corporation, which has submitted plans to the Public Service Commission for the construction of a freight subway on the river fronts and through the principal business streets. Mr. Wilgus plans a new means of construction which he would use in the event of the subway being built, and which, it is said, would entirely do away with the tearing open of streets.

Philadelphia's celebration of Founder's Week, marking the two-hundred-and-twenty-fifth anniversary of the founding of the city by William Penn, was opened tonight by the ceremony of dedicating the 28 memorial electric lamp posts on the City Hall plaza. Each cluster was switched on as a little girl, waving an electric wand, pronounced the words of dedication. Tonight the city is decorated with such a display of electric lights and bunting as it has seldom seen. A number of parades will be held during the week, but perhaps the most spectacular will be the naval parade of warships in gala attire on the Delaware River. The celebration and illumination will continue during the week.

The City Club has sent to the New York Board of Estimate and the Public Service Commission a memorandum suggesting that a substantial part of the cost of building rapid-transit subways in the city shall be assessed directly upon the properties benefited by such construction. The club says more rapid-transit roads are needed urgently, and private capital seems disinclined, at present at least, to finance the work of building. Assertion is made that the city's borrowing power is utterly inadequate to cover the need, and will be until relief may be obtained through the slow process of constitutional amendment. It seems self-evident, the club says, that other methods must be considered if the necessary lines are to be built. W.

OHIO

Toledo, October 3.—William C. Carr, formerly of Toledo, proposes to furnish quick and cheap transportation of freight parcels, mail and other commodities through the country districts, by cars running on elevated tracks, which will automatically pick up and deliver at farm houses along the line anything in the shape of packages or farm produce. The cars would be under the control of a man at the central station, one man handling 12 lines. The cars are to travel from 30 to 40 miles per hour. Working models have been on display here the past week, in charge of Fay W. Clark, who is demonstrating the invention.

The city-lighting fight at Lima continues, with considerable speculation as to the final outcome. The Council passed an ordinance for a $100,000 municipal plant, but later changed its mind about it and passed an ordinance repealing it. Mayor Becker has vetoed the repealing ordinance, and it is said that there will be difficulty in passing the ordinance over his head. The three members who have favored the municipal plant stand firm, and a tieup on the lighting proposition is anticipated, as they are not expected to assent to a new contract with the Schoepf syndicate.

Despite the consolidation of the Home and People's companies, which were recently taken over by the $1,000,000 Springfield Light, Heat and Power Company, it is said there will be plenty of competition at Springfield, Ohio, when the present lighting contract expires. The Bushnell syndicate and the Ohio Electric Railway Company are both said to be preparing to submit bids. The city is now paying $73 for 2,000-candlepower lights.

The City Council at Findlay may erect a municipal lighting plant. The committee having the matter in charge has asked for the appointment of an expert electrician to investigate and report his findings, so that the Council may act intelligently. H. L. S.

ILLINOIS

Peoria, October 3.—The Village Board of Metamora has contracted for the lighting of the streets, and as soon as the station can be erected an electric-light plant will be built and put in operation.

The Cairo and St. Louis Railway Company has been incorporated with a capital stock of $100,000, with principal office in Cairo. It is proposed to build a line from Cairo through the counties of Alexander, Union, Jackson, Randolph, Monroe and St. Clair to the city of East St. Louis. The incorporators and first board of directors are William McKinley, George M. Mattis, W. H. Carnahan and George W. Burton, all of Champaign, and L. E. Fisher of Danville. This will be another line that will come under the operation of the Illinois Traction Company, as the incorporators are all connected with the traction company, Mr. McKinley being the president of the company.

The city of Pana has been notified that the Pana, Hillsboro and Mattoon Traction Company will not accept the franchise recently granted to it. The city asks that the traction company place lights at every intersection of the streets that it crosses in the city; this, the company stated, would be impossible.

The trouble among the grand officers of the Brotherhood of Electrical Workers in Springfield has found its way into the courts. Peter W. Collins, who is the grand secretary, has filed a petition for an injunction in the Circuit Court to restrain the recently elected officers from taking possession of the files and records of the grand office. The fight is made to retain the offices in Springfield and is directed against the officers elected at the meeting in St. Louis, which, it is declared, was a rump convention. Collins further recites that Frank J. Sullivan has obtained certain records, and that unless the records are found and returned he will be unable to clear his record as grand secretary. A temporary injunction was granted by the judge. The newly elected officers deny the charge, and say that they are in the right and that they can show it at the proper time. V. N.

NORTHWESTERN STATES

Minneapolis, October 3.—The City Council of Atlantic, Iowa, has purchased an 80-horsepower Skinner engine for the electric-light plant.

The electric-light plant at Chilton, Wis., after a change in control, has started up again, after being thoroughly overhauled.

H. M. Miller, vice-president of the Des Moines-Sioux City Railroad Company of Des Moines, Iowa, announces that complete arrangements have been made to finance the bond issue.

The Chippewa Valley Electric Railway Company has installed electric lights in Elk Mound, Wis.

The proposed electric railway from Fargo, N. D., to Dilworth, Minn., may be combined with the Northwestern interurban line which it is planned to construct from Fargo to Detroit, Minn.

Edward P. Burch of Minneapolis has been employed as consulting engineer in the construction of the street railway at Grand Forks, N. D. He was authorized to construct seven miles of track immediately and will purchase all the supplies that can be used this fall.

Surveyors have been working in Greeley, Iowa, on the line of the proposed electric railway from Perry to Waterloo, Iowa.

Gregory, S. D., has electric street lights.

J. C. Peterson of Columbus Junction, Iowa, is reviving the project for an electric line between that place and Keokuk, with some show of success.

The La Crosse Water Power Company of La Crosse, Wis., will have its power lines strung into the city from the Hatfield plant by December 1st.

J. P. Carpenter is planning to establish a $60,000 electric power house at Oakland, Iowa, provided local capitalists will provide part of the amount required.

The Rice Lake (Wis.) Milling and Power Company will furnish electric lights to Cameron, Wis., as soon as its new dynamo house is completed.

The new power house and dam for the Wausau (Wis.) Street Railway Company will be completed and ready for operation about November 15th.

Westinghouse, Church, Kerr & Co. of New York have been engaged as engineers and constructors for the Sioux City and Spirit Lake Railway Company of Sioux City, Iowa. R.

WESTERN CANADA

Winnipeg, October 3.—Electric cars will be running between Edmonton and Strathcona, Alberta, within a month. The system is being built by the city of Edmonton, headed by Mayor MacDougall.

The ratepayers of Revelstoke, B. C., voted a majority in favor of raising $10,000 by the sale of debentures to complete the auxiliary power and light plant.

In order to economize its power the British Columbia Electric Street Railroad Company has been obliged to shut off all power for lighting purposes from 4 a. m. until dusk. The shortage of power is due to low water at the power plant at Coldstream, but preparations are now being made for the construction of an auxiliary plant.

The Cranbrook Electric Light, Power and Telephone Company of Cranbrook, B. C., has received a contract to install a telephone system in the municipality of Fernie.

The City Council of Winnipeg, Man., has voted an additional $22,000 for immediate work on the civic power development at Lac du Bonnet. This amount includes $6,500 for a telephone line of 24 miles and the rest for engineer quarters and other buildings. Cecil B. Smith, Winnipeg, is civic power expert.

It is expected the long-distance telephone line between Antler and Regina, Sask., will be in operation this fall. Work was commenced in September. The line is 200 miles long and requires 104,800 pounds of copper wire. This is the first line to be built by the Saskatchewan government.

The Yellow Grass Electric Light and Power Company has been granted a municipal light and power franchise at Yellow Grass, Sask.

The Yukon Basin Gold Dredging Company has secured a waterpower at the head of the Stewart River which is estimated to yield 83,700 horsepower. This power will be used to operate the company's dredges. R.

PACIFIC SLOPE

San Francisco, October 1.—The Northern California Power Company, Consolidated, recently incorporated, will on October 12th take over and operate the Northern California Power Company and five other companies—the Keswick Electric Power Company, the Tehama Electric Company, the Battle Creek Power Company, the Redding Electric Light and Power Company and the Willows Light and Power Company. All these companies operate, or are to operate, in Northern California, and all have been more or less associated under the management of H. H. Noble. Bonds totaling $3,000,000 will be issued by the new corporation to provide funds for carrying on work under construction or contemplated. It is expected that the full installation of the present system will be completed before the first of the year, and the available horsepower will then be about 13,000. Ten thousand horsepower is now being generated and delivered, serving 26 towns in Glenn, Butte, Tehama and Shasta counties besides numerous pumping stations and mines.

The Bay Counties Power Company, an auxiliary of the Pacific Gas and Electric Company, has begun work on a new transforming and switching station in the hills back of Berkley, Cal. The long-distance power line, under the new arrangement, will enter Oakland from the east, doubling back to the south from the new station, and completely circling the whole bay region. This will make it possible to supply any of the bay cities immediately if a local station should become disabled. The wires under the new arrangement will be carried south to join with those of the Standard Electric Company, which extend from Alpine County around the south end of the bay, connecting the latter plant with those of the Bay Counties Company on the American River. In this way the power of either line may be called into service in case of accident to the other. Work is progressing rapidly on the new transformer building, and it will probably be completed within the next two months. The structure is of reinforced concrete and with its equipment will cost about $115,000.

At the request of E. D. Lehe of Dixon, Solano County, the supervisors of Napa County, California, have agreed to advertise for sale a 50-year franchise to construct electric power lines over the roads of Napa County north from the town of Napa to the Lake Ccounty line, passing through St. Helena and Calistoga.

J. T. Thompson of The Dalles, Ore., will install an electric-light and power plant for Husum, Wash., having secured power rights at White Salmon Falls.

The Kennewick Electric Company of Kennewick, Wash., has been sold to the North Coast Electric Company, successor to the Northwest Light and Power Company. President R. E. Strahorn of the North Coast Company has a constructing engineer in Kennewick making arrangements for enlarging the plant. Additional boilers and engines will be installed and the capacity will be increased sufficiently to furnish light and power to Pasco, Wash.

The Tuolumne Power and Light Company, of which John C. Hays is president, has made extensive locations of water rights and reservoir sites on the Tuolumne River in the vicinity of Hetch Hetchy, where the city of San Francisco is also after large water privileges. The whole of Poopenaut valley below Hetch Hetchy has been located as a reservoir site. According to present plans a dam 150 feet high will be erected on this site. Power houses are planned for three different points along the river, the water to be carried along the left bank from the point of diversion.

Surveyors are now running the preliminary lines for the interurban electric railroad between Stockton and Modesto, Cal. The road will be 30 miles long and will pass through the most thickly settled part of San Joaquin valley. A.

PERSONAL

Mr. Montraville M. Wood of Chicago, the well-known electrical inventor, whose interesting experiments with the gyroscope are familiar to readers of the Western Electrician, has accepted an engagement to demonstrate the possibilities of that scientific curiosity on the vaudeville stage at a large salary.

Mr. J. P. Pulliam of Oshkosh, Wis., has been appointed general superintendent of the Eastern Wisconsin Electric Railway and Light Company of Fond du Lac, Wis. Mr. Pulliam is also general superintendent of the Wisconsin Electric Railway Company of Oshkosh and will have general charge of the traffic on both systems.

Albert M. Ballard, whose death occurred in the Catskill Mountains of New York the latter part of September, was connected, as electrical engineer, with many important inventions in telephony during the last 15 years. He developed electric welding under Elihu Thomson, after taking a course at the Massachusetts Institute of Technology, and was engineer for the Electric Welding Company. In 1896 he went to the Chicago Telephone Company, and since 1900 had been in the employment of the American Telephone and Telegraph Company, in Boston, and of the Western Electric Company, in New York.

ELECTRIC LIGHTING

The Gibbon (Neb.) Electric Light Company has been incorporated with a capital stock of $10,000.

Winslow, Ill., is to have electric lights, deriving current generated at the Martintown waterpower.

The City Council of Lima, Ohio, has passed an ordinance repealing the one providing for the establishment of a municipal electric-light plant. The fate of the measure now rests with Mayor Becker.

At Nelson, B. C., the City Council authorized the installation of a 1,000-kilowatt electric generator in the city power plant, giving a second unit and bringing the capacity up to 2,500 horsepower.

Fire broke out in the city water and lighting plant at Waverly, Iowa, and resulted in the complete destruction of the plant, involving a loss of $50,000. The destruction proceeded while the firemen stood helpless, because the flames attacked the very means relied on to fight them. The plant will be restored.

The illumination of Grand Rapids (Mich.) streets by series tungsten-lamp arches is to be extended from Canal Street to Monroe Street, another business thoroughfare. Campau Square is also to be lighted by the same method. The cost will be sustained by the merchants whose stores are benefited. The power is furnished by the Grand Rapids-Muskegon Power Company, which operates the 110,000-volt line into the city from Croton Dam.

When William Richards, night electrician at the municipal lighting plant at Marquette, Mich., opened the door of the generator room one morning last week he was startled at the sight of a pack of five timber wolves only a few feet distant. The animals manifested no fear, and Mr. Richards says he could have shot several before they disappeared into the nearby underbrush. It is believed the animals were driven in by the forest fires which have swept the swamps.

The electric-light and power plant of the city of Austin, Texas, is installing a 500-kilowatt Allis-Chalmers steam-turbine generating unit. For some time the power facilities of this municipal station have been inadequate and a nightly procedure of transferring loads had caused considerable inconvenience. The new turbo-alternator generates 60-cycle, three-phase, 2,300-volt current. The turbine which is designed to run condensing at a speed of 3,600 revolutions per minute, is of the horizontal, multiple-expansion, parallel, all-around flow type. A 22½-kilowatt exciter of the same make will be driven by a vertical engine, and a number of the company's type AL lighting transformers are in use.

ELECTRIC RAILWAYS

The Scioto Valley Traction Company of Columbus, Ohio, has announced an increase of capital from $3,000,000 to $3,500,000; Charles Davis is president, and E. R. Sharp, secretary.

The fact that the United Railways, which has under project an electrical line from Portland, Ore., to Tillamook, is pushing ahead with its construction work more energetically than any other company in the Pacific northwest, causes a belief that one of the big roads, presumably the Northern Pacific, is behind it.

United States Consul H. B. Miller of Yokohama, Japan, says that the Keihin Electric Company has practically succeeded in obtaining from London capitalists a loan of $996,000 wherewith to build an electric railway from the Aoyama terminus of the Tokyo Railway to Shinagawa. Official permission was obtained some time ago, and the only question that remained was that of finance. It is said that this company intends to double its Omori Shinagawa line, with a view to the probability that the fisheries section of the great exhibition will be established at Haneda.

Traffic on the elevated railways in Chicago for the month of September continued to be less than for the corresponding month last year except on the Northwestern Elevated, which has since then put in service the Evanston extension. The daily averages are as follows: Metropolitan, September, 1908, 131,354; September, 1907, 140,979. South Side, September, 1908, 116,490; September, 1907, 118,256. Northwestern, September, 1908, 105,700; September, 1907, 97,447. The figures for the Chicago and Oak Park line are not yet completed, but they will show a falling off also in all probability.

The Puget Sound International Railway and Power Company, one of the Stone & Webster holding companies, has formally taken over the property of the Sander Seattle-Everett interurban project. The line is to be completed to Everett by next spring. The line to Everett is to be followed by an extension to Bellingham over a route which has already been surveyed. It is also reported that a survey is being made between Bellingham and Blaine, on the Canadian border. Tacoma and Seat-the are already connected by a Stone & Webster interurban. From Tacoma a line is proposed to Olympia. A branch will be run from there to Grays Harbor, and the main line will be extended eventually to Vancouver and Portland.

The Boston Elevated Railway Company's fiscal year ended September 30th. The showing made in gross earnings was as good as was expected, considering the conditions prevailing for the year. There was an increase, but it was the smallest gain made in any fiscal year in the company's history, amounting to but $75,000, or 0.6 per cent.

Announcement has been made that the suburban zone of the Delaware, Lackawanna and Western Railroad from Hoboken to Morristown, N. J., will be electrified shortly after January 1st. The plans of the company, according to the Electric Trunk Line Age, comprise the installation of electric service over a stretch of 32 miles. For more than a year the engineering department of the Lackawanna has been studying the operation of electric roads throughout the country, with particular attention to the admirable equipment of the New York Central. The proposed work is on a rather ambitious scale, as the railroad contemplates the expenditure of about $25,000,000 during a period of three years.

POWER TRANSMISSION

The government has closed a contract with the Westinghouse company for 2,000 horsepower in generators for the Minidoka reclamation project. A 600-horsepower pumping outfit will be installed and the contract calls for an expenditure of $175,000.

Plans and surveys have been made by the Westinghouse Electric and Manufacturing Company for a power plant on French Creek, a few miles east of Canton, S. D., which will develop 600 or more horsepower for use in the mines and factories nearby and for general lighting purposes in the city.

A contract entered into between the Northern Pacific Irrigation Company and the Northwest Light and Water Company provides for a transmission line to be built from the water plant of the latter company, on the Natchez River, to the city of Kennewick, which is to become the headquarters of the company for the Columbia River district. Power will also be transmitted to Pasco.

TELEPHONE

The Traer (Iowa) Mutual Telephone Company has increased its capital stock to $72,000.

The Wolfback Telephone Company has been incorporated at Wolfback, Neb., with a capital of $30,000.

The Hancock (N. Y.) Telephone Company is constructing a toll line to Deposit, N. Y. Many other improvements are under way.

At a meeting at Dyersville, Iowa, a contract was signed by the Interstate Telephone Company and the local Bell company for toll connections between the two.

Thomas Peebles, secretary of the Mississippi Valley Telephone Company, has denied the rumor that his company had sold out to the Iowa Telephone Company.

A long-distance telephone line, more than 210 miles long, is to be installed between Pietersburg and Pretoria and Johannesburg, South Africa. It will be the longest of the Transvaal telephone lines.

PUBLICATIONS

The September number of the monthly bulletin of the Ohio Brass Company, Mansfield, Ohio, marks the fourth anniversary of this publication. Some new electric-railway fittings are the chief features of interest of the number.

Circular No. 1118 of the Westinghouse Electric and Manufacturing Company contains a complete description of classes CCL and HF polyphase induction motors and starters. Illustrations of other applications to machines in any line of industry will be sent on request.

"Hot Points" for September, number three of the Pacific Electric Heating Company's little monthly devoted to electric flatirons and toasters, is gotten up with the same novelty in form and material which characterized the preceding issues. Hot Points is printed at the factory, Ontario, Cal.

Northern type S motors, made by the Northern Electrical Manufacturing Company, Madison, Wis., are described in its Bulletin 59. These motors are built open, semi-enclosed and enclosed for mill and factory service and are designed for constant and adjustable speed. They have the feature of the split-pole structure which opposes the distortion due to cross-magnetization by the loaded armature.

The Hill Clutch Company, Cleveland, Ohio, engineers, founders and machinists, has issued a catalogue showing its forms of shaft bearings having oil-ring lubrication and so arranged that the oil collar assumes the shaft thrust. These bearings and base plates are made in a great many sizes and types.

"The Lighting of a Dining Room," which is the leading article for the September number of Holophane, the publication of the Holophane Company, New York, describes a model installation, the illumination in the Arlington Hotel, Hot Springs, Ark., which may be used as a guide in similar problems.

Special porcelain for special purposes, made by the Colonial Sign and Insulator Company, Akron, Ohio, is shown in a great variety of forms in a circular issued by the company. Porcelain parts for electrical use include bases for fuses, lightning arresters, sockets, terminals, insulators, sign letters and a number of complicated designs.

A number of new catalogues has been prepared by the Central Electric Company, Chicago. Among these is a circular on special flush-type group switches and receptacles of the Perkins type. There are also described new designs of pendent switches with both bottom and side release and a new shallow type of universal push-button switch for use in all standard devices. Another circular describes a complete line of recording voltmeters, ammeters and wattmeters, the portable types being mounted in compact wooden cases for easy handling.

The system of electric drive planned for the new mill of the Watab Pulp and Paper Company, near St. Cloud, Minn., affords a striking example of minimized transmission losses. A complete description of the equipment, consisting mostly of induction motors ranging from 5 to 100 horsepower, is given in an article reprinted by the Allis-Chalmers Company of Milwaukee. The paper plant has now been in continuous operation for some time. It began making paper a few hours after current was first turned on and has not been shut down since due to failure of equipment, an unusual performance for a mill of this size.

Stone & Webster, Boston, have issued primarily for the benefit of persons and institutions within their own organization a list of "Current Literature References, 1907," which takes the form of 140 pages of condensed reference matter pertaining to engineering, scientific and technical articles that appeared in the large list of periodicals received by the organization's library. The index is complete and arranged for ready reference on any topic. The pamphlet is reprinted from a card catalogue maintained by Stone & Webster and the edition is sufficiently large to allow of general distribution among their men in the field and to enable a limited number of copies to be sent to persons and institutions outside.

Among recent publications of the General Electric Company is booklet No. 3700, descriptive of its "multi-catch" socket. The advantage in the use of this socket lies in the facility with which it can be attached to a fixture containing a husk. No screwdriver is needed, the shell being snapped in place and rigidly held at four points. Bulletin No. 4616 contains a detailed description of high-voltage type H transformers. These transformers are designed for indoor operation in connection with long-distance transmission lines. In bulletin No. 4618 there is described the new form PB polyphase generator for use in small power plants and isolated lighting plants where rapidly increasing inductive loads and consequently low-power factors are encountered. Automatic potential regulators for use on feeders for lighting circuits are described in bulletin No. 4619, which is attractively gotten up with the title "Steady vs. Unsteady Voltage." In bulletin No. 4622 the company illustrates and describes its polyphase maximum-watt-demand indicator, which is suitable for recording the maximum load on alternating-current circuits irrespective of power factor and voltage fluctuations.

SOCIETIES AND SCHOOLS

On October 12th the evening school classes at Lewis Institute, Chicago, will begin the fall-term work. In the Western Electrician of February 22, 1908, these evening electrical courses were described in some detail. There has now been added a fourth-year course on alternating-current theory. This will be principally a mathematical treatment based on the use of complex quantities according to Steinmetz's symbolic method. This advanced work will be given by Prof. J. D. Nies. With a number of assistants Profs. F. A. Rogers and P. B. Woodworth will instruct the other electrical students as usual, Professor Woodworth having general supervision over all the evening courses. It is expected that the registration for these classes will be much greater than heretofore.

The bibliographical catalogue of the books, pamphlets and periodicals of the celebrated Latimer Clark collection presented by Dr. Schuyler Skaats Wheeler to the American Institute of Electrical Engineers has just been completed and is about to go to press. This critical catalogue has been in preparation for the last six years under the direction of Mr. W. D. Weaver, with the collaboration of Brother Potamian of Manhattan College and a number of other authorities here and abroad. The expense of this unique work has been defrayed by Mr. Andrew Carnegie. As soon as the book comes from the press it will be distributed to the members of the Institute.

TRADE NEWS

The Electrical Employment Agency, conducted at Deposit, N. Y., by Benjamin H. Wade, is to be incorporated under the name of Wade's Employment Exchange. Many improvements are to be made in the office equipment. Bids for same will be opened on November 10th.

The Western Electric Company has bought a tract of 40 acres at the southeast corner of Twenty-sixth Street and South Forty-eighth Avenue, Chicago, on which it will build a large addition to the present Hawthorne plant. The company now owns and has improved most of the land between Twenty-sixth and Twenty-second streets and Forty-eighth and Forty-fourth avenues.

The Massachusetts Chemical Company is building a new addition to its factory at Walpole, Mass., comprising some 15,000 square feet of floor space, to accommodate the electrical tape department which has outgrown its present quarters. This line of friction tapes has been designed to fulfill all the essentials of a high-class insulating product, viz., permanence, chemical neutrality, adhesiveness and moisture-proof quality.

The Stave Electrical Company, now at 27 West Twenty-seventh Street, New York city, has found it necessary, in order to facilitate the distribution of Stave flaming arc lamps, to move into much larger quarters at the new address given. The business of this company has increased very rapidly, owing to the great satisfaction with which the lamp has been received, and it was found advisable to make this change of location.

BUSINESS

The town of Hartley, Iowa, has awarded a contract to the Minneapolis Steel and Machinery Company for an 80-horsepower Muenzel producer-gas engine and suction gas-producer for the municipal electric-light plant. The bids were received on September 24th.

Where coal, ashes, sand and lime are handled in bulk in large quantities the use of electric power in transferring material of this nature from boats to wharves, from cars to carts or from bins to boilers, effects a valuable economy. The grab-bucket mono-rail crane of the Sprague Electric Company, New York city, is designed to lift, carry and shovel, and only one man is required to unload a barge or car and deposit the material. The apparatus is simple, requiring only one electric controller to handle the shovel. By putting the single controller handle on the proper notch the bucket is hoisted, lowered, opened or filled and closed.

Dossert & Co., Inc., 242 East Forty-first Street, New York, received an order from the Central Electric Company of Chicago, Ill., for 1,000 Dossert solderless lugs, ranging in size from No. 6 to 1,250,000 circular mils, and comprising front-connected, back-connected and 60-degree angle lugs. The order also includes about 100 Dossert solderless cable taps. Orders have also been received for large cable taps and lugs for use on the heavy cables of the Great Western Power Company in California, and from the Illinois Tunnel Company for 1,000 cable taps, reducers and special terminals for the wiring of the signal service in the Chicago subway.

DATES AHEAD

New York Electrical Show (second annual), Madison Square Garden, October 3d to 14th.

American Street and Interurban Railway Association (annual convention), Atlantic City, October 12th to 16th.

Sons of Jove (annual meeting), Buffalo, N. Y., October 15th and 16th.

Western Association of Electrical Inspectors, annual meeting, Chicago, October 20th to 22d.

Illinois State Electric Association (annual convention), Illinois Hotel, Bloomington, October 27th and 28th.

American Electrochemical Society (fall meeting), New York city, October 30th and 31st.

Association of Car Lighting Engineers (first annual convention), Chicago, November 16th to 21st.

Chicago Electrical Show (fourth annual), Coliseum, January 11th to 23d, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) September 29, 1908

899,513. Pump. Joseph H. Champ, Cleveland, Ohio. Application filed September 25, 1905.
A pinion on the armature shaft of the driving motor meshes with the main driving gear of the pump.

899,514. Switchboard Signal Lamp. Edward B. Craft, Wilmette, Ill., assignor to the Western Electric Company, Chicago, Ill. Application filed February 1, 1907.
The base of the lamp has a conical socket and channels in its lateral surface. In these channels lie tongues extended from the terminal plates of the lamp.

899,524. Telephone Cut-off. Henry S. Gilbert and William F. Drake, Pueblo, Colo. Application filed October 26, 1907.
A small switch is attached to the receiver and connected by wires to the microphone element of the transmitter.

899,535. Electrical System of Distribution. Albert S. Hubbard, Belleville, N. J., assignor to the Gould Storage Battery Company. Application filed January 29, 1908.
An alternator supplies an alternating and a direct-current circuit. The latter contains a storage battery and booster, which is provided with a special regulating apparatus.

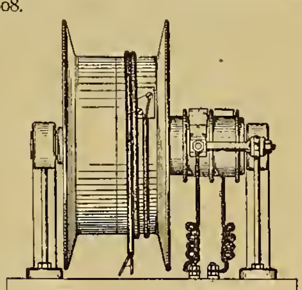
899,564. Selective Signaling System. Harry O. Rugh, Sandwich, Ill. Application filed December 9, 1907.
This circuit selective appliance has a step-by-step electromagnetically actuated switching mechanism.

899,588. Transportation System. William C. Carr, Buffalo, N. Y. Application filed September 25, 1906.
A loop track with a number of branch stations has an electrically energized rail. The car traveling over the loop has electrical means for indicating its progress on an indicator at the central station.

899,593. Automatic Third-rail Contact-shoe Guard. William E. Hayes, Frankfort, N. Y. Application filed January 22, 1908.
This contact shoe is provided with a movable protecting insulator. Means are arranged in advance of the shoe and acting on the third rail to move the insulator aside as the rail is approached.

899,598. Solenoid Motor. Lemuel F. Howard, Edgewood Park, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Application filed October 23, 1906.
The solenoid core is composed of two sections normally tending to move inwardly in opposite directions.

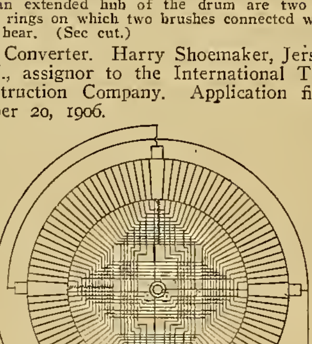
899,613. Cable Drum. Alvin A. Pifer, Cleveland, Ohio, assignor to the Cleveland Armature Works, Cleveland, Ohio. Application filed March 6, 1908.



No. 899,613.—CABLE DRUM

On an extended hub of the drum are two insulated contact rings on which two brushes connected with a live circuit bear. (See cut.)

899,629. Converter. Harry Shoemaker, Jersey City, N. J., assignor to the International Telegraph Construction Company. Application filed December 20, 1906.



No. 899,629.—CONVERTER

A number of commutator segments are connected by various resistances and are supplied with direct current through a set of collector rings. (See cut.)

899,634. High-potential Spark Coil. Chester H. Thordarson, Chicago, Ill. Application filed December 23, 1907.
The core of the coil has an air gap in its magnetic circuit. A movable armature is arranged adjacent thereto.

899,636. Grounding Clamp for Electric Wires. Wheeler H. Vibber, New London, Conn., assignor to the Gillette-Vibber Company, New London, Conn. Application filed April 20, 1907.
A metal strip made in one piece extends around the pipe or cable. Its ends are clamped by a binding screw into one end of which the ground wires are soldered.

899,637. Electric-installation Molding Box. Wheeler H. Vibber, New London, Conn., assignor to the Gillette-Vibber Company, New London, Conn. Application filed June 11, 1907.
On the side of the box are openings to receive the molding ends. The circular box cover is adapted to have a lamp fixture directly attached to it.

899,638. Combined Bushing and Coupling for Electric Installation. Wheeler H. Vibber, New London, Conn., assignor to the Gillette-Vibber Company, New London, Conn. Application filed January 30, 1908.
One end of a conduit elbow has a bushing end with a nut so as to make it applicable to an outlet box or cabinet. The conduit end has a transverse slot and a clamping ring.

899,639. Box Connector for Electric Installation. Wheeler H. Vibber, New London, Conn., assignor of one-half to the Gillette-Vibber Company, New London, Conn. Application filed June 4, 1908.
A bushing is formed with a transverse slot into which a yielding binding strap provided with a binding screw enters.

899,641. Pleasurephone. Charles A. Wardner, Brushton, N. Y. Application filed April 19, 1907.
In this system the subscribers' stations have receivers only and the transmitters are arranged so as to be acted on jointly and simultaneously from the central station.

899,705. Method of Production of Nitrites. Claus N. Riiber, Christiania, Norway, assignor to Aktieselskabet det Norske Kvaelstofkompagni, Christiania, Norway. Application filed January 6, 1905.
The process consists in blowing air through an electric arc in a suitable furnace and leading the gas mixture so formed directly into compounds of alkalies or alkaline earths contained in a chamber separate from the furnace.

899,708. Connection for Electric Conductors. Frank H. Ball, North Plainfield, N. J. Application filed August 6, 1906.
A spring loop is provided with attaching devices at its ends.

899,733. Valve Recording and Indicating Device. Harrison C. Howard, Conimicut, R. I. Application filed March 13, 1908.
Connected with a manually controlled valve is a recording device to indicate the extent of its opening and an electric annunciator.

899,749. Fire Alarm. Bernard B. Mears, Baltimore, Md. Application filed November 16, 1907.
In the sleeve of a casing is a circuit closer connected with the alarm.

899,751. Ignition-controlling Apparatus. Charles Mitchell, Jr., Milwaukee, Wis. Application filed October 21, 1907.
A switch is lifted to make contact with a set of terminals by means of a solenoid and dropped by gravity so as to make contact with a lower set of terminals.

899,770. Ignition System for Explosion Engines. Richard Varley, Englewood, N. J., assignor to the Varley Duplex Magnet Company. Application filed November 8, 1907.
In the primary circuit of an induction coil are means for including a number of contacts.

899,787. Telephone System. Alfred H. Dyson, Chicago, Ill., assignor to Milo G. Kellogg, Chicago, Ill. Application filed February 5, 1906.
A multiple-switchboard telephone-exchange system is described.

899,822. Clutch. Heinrich Ast, Vienna, Austria-Hungary, assignor to the firm of Vulkan Maschinenfabriks-Actien-Gesellschaft, Vienna, Austria-Hungary. Application filed June 15, 1906.
Mechanical features of an electromagnetic clutch are disclosed.

899,823. Primary Battery. Wilhelm A. F. Bleeck, Brisbane, Queensland, Australia. Application filed March 20, 1908.
This double-fluid battery consists of a zinc electrode in a solution of sodium hydroxide and a carbon electrode in a depolarizing solution of chromic acid with hydrogen peroxide and hydrochloric acid.

899,827. Process of Making Ingots. Frank Cutter, Providence, R. I. Application filed April 23, 1908.
The process of making cylindrical ingots adapted to be reduced to seamless wire consists in depositing upon a metallic rod by electrolysis a film of another metal, and impacting simultaneously all parts of the metal after it is so deposited upon the rod.

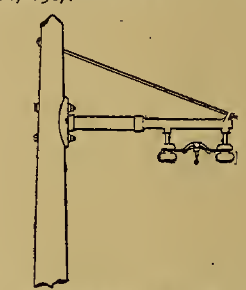
899,836. Barometer. Jacob Nelson, Chicago, Ill., assignor to the Edward P. Martin Company, Chicago, Ill. Application filed November 5, 1906.
Extending into the mercury cistern are two contact pins for indicating the zero line. The pins are connected with an electric alarm.

899,839. Heating System. Andrew G. Paul, Boston, Mass. Application filed May 15, 1900.
An electric thermostat controls a steam-radiator system.

899,850. Telephone-exchange Apparatus. Emil Tanke, Berlin, Germany, assignor to Siemens & Halske A. G., Berlin, Germany. Application filed June 17, 1905.
Combined with a number of calling groups and their respective annunciators are sets of single and double-coiled relays.

899,858. Trolley-wire Hanger. James Bryan, Pittsburg, and Harry Etheridge, McKeesport, Pa. Application filed March 20, 1907.
On the span wire is an arch member to which is coupled the trolley-wire supporting member.

899,859. Aerial-trolley Support. James Bryan, Pittsburg, Harry Etheridge, McKeesport, and Edgar M. Balsinger, Pittsburg, Pa. Application filed April 18, 1907.



No. 899,859.—BRACKET TROLLEY CONSTRUCTION

A bracket construction for a high-potential trolley is described. (See cut.)

899,903. Mail-delivery Apparatus. Charles E. Reid and John Heissenberger, New York, N. Y. Application filed December 27, 1906.
In a chute are a number of carriers elevated by means of an electric motor. Closing of a door in the chute completes the circuit through the motor and starts the operation of the carriers.

899,983. Adding Machine. William S. Horry, Niagara Falls, N. Y., assignor to the Burroughs Adding Machine Company, Detroit, Mich. Application filed September 26, 1903.
The operating means for this machine are driven by an electric motor, whose switch is manually closed and automatically opened at the end of the operating movement.

900,005. Electric Switch. Charles W. Wachtel, Jamaica, N. Y. Application filed November 23, 1907.
Two contact clamps are provided with bent metal strips engaging the rotary oscillating switch bar which carries a contact strip.

900,006. Push Button. Charles W. Wachtel, Jamaica, N. Y. Application filed November 23, 1907.
A V-shaped contact head at the inner end of the button is adapted to engage two contact points.

900,035. Electric-motor Starter. William C. O'Brien, Baltimore, Md., assignor to the Monitor Manufacturing Company of Baltimore City, Baltimore, Md. Original application filed October 23, 1905. Divided and this application filed September 10, 1906.
A series of electromagnetic switches for cutting out resistance from the armature circuit is provided with a holding solenoid to keep the switches in open position.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired October 6, 1908:

460,572. Printing Telegraph. M. G. Farmer, Eliot, Me.
460,587. Electric Arc Lamp. H. W. Libbey, Boston, Mass.
460,595. Arc-lamp Pencil. I. L. Roberts, Brooklyn, N. Y.
460,596 and 460,597. Electrode for Arc Lamps. I. L. Roberts, Brooklyn, N. Y.
460,599. Electrode for Secondary Batteries. Wm. A. Rosenbaum, Jersey City, N. J.
460,619. Steno-telegraphic Apparatus. A. Wood, Philadelphia, Pa.
460,680. Arc-lamp Electrode. H. W. Libbey, Boston, Mass.
460,695. Electrically Controlled Cutting Device. Le Roy S. White, Waterbury, Conn.
460,767. Central-station Apparatus for Call Boxes. E. R. Wilder, Kansas City, Mo.
460,771. Telegraph Block System of Railway-traffic Control. D. C. Coombes, Lewisham, and W. Rowe, Marrickville, New South Wales.
460,779. System of Electrical Signaling for Railroads. S. De Jager and A. Zoutman, Denver, Colo.
460,781. Electric-railway Trolley. E. E. Keller, Chicago, Ill.
460,887. Electric Railroad. I. Robbins, Sheffield, Ala.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, OCTOBER 17, 1908. No. 16

NEW YORK ELECTRICAL SHOW

The second annual New York Electrical Show was brought to a close on Wednesday, October 14th, in a greater blaze of illumination than that with which it opened 10 days before. Never in its history has Madison Square Garden been so brilliantly lighted. The tungsten lamp was mainly responsible, but it was not alone, for all varieties of electric illuminants could be found at the show.

The garden tower was the pride of the show management. It was not until the middle of the first week that this part of the lighting was completed, but when it was finished it was well worth the labor expended upon it. Directly under "Diana," which is the topmost pinnacle of the tower, was the large searchlight loaned by the New York Times. Beneath this were six Cooper Hewitt tubes. These tubes, each six feet in length, the largest ever made, were constructed purposely for the show. Below them an immense sign carried the words "Electrical Show." Each of the minarets was, for the first time, tipped with a golden ball in the shape of a flaming arc lamp. There were 16 of these arcs in the tower proper, and on the Twenty-sixth Street and Madison Avenue corner hung one of the largest flaming arc lamps in existence. It contained four arcs of the ordinary type. The facade was also illuminated by flaming arcs and the entire outdoor effect was one of unexcelled brilliancy.

The lighting of the lobby was by Moore tubes reinforced by hundreds of tungstens. Over the door of the inner entrance hung a big "Welcome" sign, and many thousand people passed under it into the fairyland of light within.

The first general impression on entering the garden was one of astonishment. The interior decorative display, in addition to the individual lighting schemes of the exhibitors, was aglow with thousands of tungsten lamps and two or three dozen flaming arcs. The three sunbursts, each having 600 sockets that usually form the main lighting of the garden, had been denuded of their carbon-filament lamps and filled with tungstens. Along all the beams of the ceiling this "new lamps for old" method had maintained. In all there were nearly 4,000 tungsten lamps used on the interior of the garden for general lighting. These lamps were loaned to the show by the General Electric Company and the National Electric Lamp Association, and the flaming arcs by the Excello company, Fox Bros. and the German-American Electric Company.

To enhance this general effect each exhibit was lighted in a manner to get the best possible illuminating value as a whole.

On entering, the first exhibit to draw attention was that of the United Electric Light and Power Company, which furnishes alternating current to certain districts in New York city and handles a large part of the sign business. Its booth was built with three departments, two wings and a dome-covered center. This dome was of vari-colored glass, and high above it swung the United Electric sign. Alternating-current devices of every description were displayed here. Among the things that compelled the most attention were an alternating-current motor that continued in action in spite of the fact that it was more than half submerged in water; incubators in which the onlookers could see fluffy little chicks hatched while they waited; coffee mills; meat choppers; automatic tire pumps; a moving picture machine in action; a complete dental outfit set up and ready for business; and a full line of alternating-current household devices. The novelties shown in this booth made it very popular.

Across the aisle from it was located the engineering department of the National Electric Lamp Association. Here most of the exhibit was placed on the cross-beam arches that formed the top of the booth. All styles and sizes of tungsten lamps were shown by this method. The particular features to which attention was called were the tungsten multiple lamps of various sizes to be operated on 100 to 125-volt circuits. A bulletin board containing the list of the lamp companies was outlined with six-volt miniature tungstens. An exhibit was also displayed by the association showing the various materials from which the tungsten lamp is made.

A pergola festooned with foliage formed the center of the General Electric Company's space. Two wings, in one of which were domestic devices and in the other commercial and industrial appliances, completed it. In the domestic department all of the General Electric line of household articles were demonstrated. Here, too, the new "G. E." 20-candlepower, 25-watt tungsten lamp was shown side by side with the carbon 16-candlepower lamp that consumes 56 watts and gives less light. This lamp is made with four hairpin metallic tungsten loops, with glass support, each of which loops is in series with the others, permitting of repairs, if the filament breaks, by welding of the separated ends. The new stationary luminous radiator which, it is said, will cost at the 10-cent rate only 7½ cents an hour to operate, was also on hand. Among the "G. E." cooking devices loomed prominent a brand-new automatic coffee percolator that makes coffee without bringing the water to the boiling point until after the coffee is ready to serve. A new model iron that will heat ready for ironing in two minutes and will hold the heat for 10 minutes after the current is disconnected was demonstrated.

In the other half of this exhibit a full line of "G. E." miniature tungsten lamps for all purposes was displayed. These included specialties for dental and surgical instruments, automobiles, etc. A device to measure the candlepower of lamps while showing the wattage consumption, in which carbon and tungsten lamp comparisons were made, interested many. Tantalum 25, 40, 50 and 80-watt lamps and tungsten 25, 40, 60, 100 and 250-watt lamps were part of this exhibit. These were all shown under new type Holophane reflectors. Another example of the efficiency of the tungsten was given here by balancing one 250-watt tungsten against 13 16-candlepower 50-watt carbon lamps. Other things in this booth were circuit-breakers, induction motors and regulating field and controlling rheostats.

Opposite the "G. E." booth was the leafy bower,

GENERAL VIEW OF THE NEW YORK ELECTRICAL SHOW FROM BALCONY

New York Edison Company

United Electric Light and Power Company

TWO OF THE MOST STRIKING BOOTHS AT NEW YORK ELECTRICAL SHOW

where the New York Edison Company received. This was the most beautiful booth in the entire hall. A space 32 by 56 feet was taken by this company and turned into a veritable trellised grape arbor. A profusion of red and green "grapes" hung among the leafy vines, and from each separate bunch there radiated a soft mellow glow that gave the whole place an irresistible charm, and further proved the very ornate adaptability of the ever-present tungsten. Aside from the beautiful lighting effect carried out by the fruit clusters underneath and by outline lighting above in the big dome of the "arbor," artistic portables, potted plants, palms and great easy chairs made it a favorite resort. The only things exhibited here were a number of miniature models of the New York street arc-lighting system, for which the New York Edison Company furnishes the current.

On the balcony of the garden this company also gave a practical demonstration of its card system of bookkeeping, by means of which, though it has many thousand accounts, it is yet able to get its trial balance for the month preceding out by the third of the month following. The electrically operated machines that make this possible are so nearly human as to be almost uncanny.

"Watch Brooklyn Grow" was the motto of the Brooklyn Edison Company, whose display occupied the entire lower end of the garden. The enormous "Brooklyn" sign didn't allow any of the crowds to forget the location. This display was almost unique in its universal appeal. All classes of central-station customers or possible customers found something interesting here. The space was divided into four distinct parts and each held an exhibit of specialized interest. The "Industrial" space was devoted to the exploitation of the electric motor for manufacturing purposes. To that end a gas engine, a steam engine and an electric motor, each of 25 horsepower, were installed and shown in action. Large signs on the walls gave the difference in the amount of floor space required, also the difference of monthly operating cost. This latter read, "Steam, $131.53; gas, $107; electric, $98.74." Believing that figures talk the Brooklyn Edison distributed a small circular detailing these estimates.

The next section of the Brooklyn display showed the commercial use of the service. In a small, well-equipped shop devoted to men's furnishings the possibilities of the tungsten lamp as a store illuminant were demonstrated. Four tungstens made the shop one of the brightest spots in the garden and the prospective customer was informed that this quantity of light, burning three hours a day for a month, would cost him only $3.75. A new automatic speed control was given predominence in the next division. This mechanism has been especially evolved for large printing presses or other machines of more than one-man operation. They accelerate, slacken or stop a machine instantly and have eight degrees of speed.

The women who attended the Electrical Show, and they were by no means in the minority, showed a decided predilection for the domestic department of the Brooklyn company. Here young women, daintily gowned, demonstrated the many and various uses to which electricity lends itself in the home. A sewing machine, electrically run, was in constant operation. A clothes washer and electric drier were busy enough during the two weeks to have washed and dried numerous family washings. In the new model Simplex range some delicious concoction was prepared every few moments. The range in use was one of the nine new Simplex models now on the market and was large enough to cook with ease a full-course dinner for 50 people. Another device made by the Simplex Company and shown in the Brooklyn Edison booth was an electric heater attachment for the kitchen boiler. This was an absolute novelty and attracted much attention. It is manufactured for three degrees of heat—

EXHIBIT OF BROOKLYN EDISON COMPANY AT NEW YORK ELECTRICAL SHOW

500, 1,000 and 2,000 watts. The 500-watt boiler, run continuously, will furnish a good supply of hot water for the household.

A refrigerating plant was in practical use in this exhibit. The regular line of chafing-dishes, milk warmers, irons, coffee percolators and general household utilities were shown. A new at-the-last-minute decorative outfit of flower globes was on view. But the thing in which many of the housewives seemed to take special interest was the Aderer automatic kitchen. This is an especially constructed table to which are attached many utensils for operations necessary in the kitchen during the day. A motor is arranged in the center of the table and can be attached to any one or two of these utensils at once. Among the things it does are coffee grinding, meat or food chopping, egg beating, cream whipping, cake mixing, bread mixing, butter churning, grating, ice chopping, ice-cream freezing and noodle cutting. For all of these operations the outfit is complete and it requires no more space than a small kitchen table.

The Brooklyn Edison has established a standard with its exhibits, both this year and last, that it will require some ingenuity to maintain.

The Excello Arc Lamp Company had in its booth the first flaming arc lamp shown commercially in this country. It has been in use ever since 1905 and has never even had to have a new screw. The company displayed several Excellos, one an alternating-current lamp burning singly with a transformer taking 600 watts. Twenty-nine of the flaming arcs that helped to light both exterior and interior of the garden were furnished by this company. The 'farm" in the basement, where the cows were electrically milked, was lighted with Excellos.

G. M. Gest, the underground distribution engineer and contractor, displayed a new method for reinforcing corroded tubular poles. It is adaptable to either trolley or lighting poles. He also showed the Gest underground cable splice boxes and the Gest cable racks. The H. B. Camp Company in the same booth showed single and multiple vitrified conduit.

In the Simplex electrical heating booth a number of new devices were found. Among these were the range and water heater already mentioned in connection with the Brooklyn Edison display. Another new kitchen accessory was a double-action waffle iron. This iron cooks the waffles on both sides at once—a thing that has never been done before. The scheduled time is two waffles every three minutes. A new three-gallon coffee percolator was shown for the first time. This is the largest one made and is being especially exploited for central stations that are giving or about to give cooking demonstrations. A cord support that never allows the cord to interfere with the ironing process was another new Simplex device. This support is equipped with a lamp indicating whether the current is on or off.

On the right balcony were all kinds of electrically operated office labor savers—adding machine, automatic time clock, addressographs, envelope sealer, and the Edison phonograph for business use. One of the interesting things displayed in this connection was a phonograph constructed to run on either direct current or alternating current by the simple turning of a switch.

Wireless telegraphy and the wireless telephone proved two of the most interesting exhibits. There was a continuous crowd about the booth where wireless messages were received from the Times and printed for distribution on an electrically driven press.

The electrical testing laboratories gave several very instructive tests. One of these was very spectacular and held the interest even of those who had no idea of its technical value.

To many the most interesting features of the show were those of historical value. It would be difficult to duplicate the exhibit showing the development in electric lighting since 1882, and it would be impossible to give anything like an adequate idea of the historical submarine cable exhibit in a short description.

A lecture on this subject was given by Mr. William Maver in the garden concert hall under the auspices of the New York Electrical Society on Monday, October 12. Lectures on other electric subjects were given every evening and were very well attended.

The sign companies were well represented both in their own exhibits and in those of others. Signs of every make hung suspended in all parts of the garden. The Federal Electric Company showed a number of styles of signs in its booth. The talking sign of the Electric Motor and Equipment Company occupied one entire end of the balcony and was kept in continuous operation. It was composed of 60 letters and caused no end of interested comment by its continuous operation. F. N.

NEW METHOD OF DIRECTING WIRELESS MESSAGES

An important discovery has been made in the method of directing wireless messages by two Italian engineers, Messrs. Tosi and Bellini. By their method it is said to be possible for a wireless station to send out waves in a single direction, so as to reach the station with which it is desired to work. On the other hand, the station can direct its apparatus so as to receive only the waves coming from a certain direction. This seems to give the desired solution of the difficult problem of connecting two wireless posts to the exclusion of others and thus keeping the messages secret. According to the accounts of the most recent experiments, it seems that the apparatus now works in a very practical manner.

In March, 1907, the two engineers established three experimental wireless posts on the Channel coast, with the authorization of the French government. These plants are situated at Havre, Barfleur and at Pourville, not far from Dieppe. Since that time they continued making experiments upon the problem of directing the waves, and finally arrived at a practical result which at the same time constitutes a scientific discovery of great value. The recent trials leave but little doubt in this regard, and the Paris correspondent of the Western Electrician concludes that it is practically proved that a method of directing the waves has now been realized.

The principle of operation depends upon the compounding of two electromagnetic fields in two perpendicular directions. Thus a wireless plant laid out on the inventors' plan contains two oscillating circuits formed by antennæ, which lie perpendicular to each other, together with special rotating apparatus placed in the building, which allows of transmitting and receiving according to a determined direction.

TALKING SIGN AT NEW YORK ELECTRICAL SHOW

Taking the station at Dieppe as a center, the angle between the straight lines from Dieppe to Havre and from Dieppe to Barfleur is about 23 degrees. Under these conditions the signals which are sent from Dieppe can be received at Havre or at Barfleur by changing the direction of the waves, and the message designed for the former post cannot be received at the latter. The apparatus at the Dieppe station, which is laid out as a transmitting and receiving plant, consists of a 350-foot mast which holds two sets of antennæ of triangular form, situated in the same plane, and two others placed in a plane perpendicular to the latter. These two systems act in conjunction in order to give the directed waves. Inside the building is a regular wireless-telegraph outfit and a special directing apparatus, which the inventors call a "radio-goniometer," as it serves to measure the angles of direction of the waves.

In the early experiments the inventors tried to obtain the varying of direction of the waves by turning the antennæ, but this was found to be impossible in practice. They then decided to leave the antennæ in a fixed position and use the revolving apparatus inside the station, which produces the same result. This device has the form of a cage which carries the secondary current, and inside the cage revolves a frame carrying a coil mounted on a vertical axis. The latter forms the primary circuit. When the inner frame is turned about, this being done by observing a needle which works over a dial graduated into 360 degrees, in the direction of the plane of one of the antennæ, the waves are transmitted in this direction. When the goniometer needle is placed in an intermediate position, the two antennæ are excited in proportion to the angles which are formed with their planes, and both masts act together and proportionally in the directing of the waves. In the receiving station a similar apparatus allows of regulating the direction so as to receive the waves coming from any point of the horizon.

While this arrangement solved the problem of directing the waves in general and of receiving them from a certain point, one step remained to be taken. This was due to the fact that it was impossible to determine whether the message came from the front or the rear of the receiver, that is, from the east or the west, as the straight line extends in both directions from any given receiving post. The engineers succeeded in solving this problem by an ingenious method. In the above conditions the waves from a given post are sent or received by waves which radiate out from the front and rear at the same time. The two radiations are equal and in opposition of phase, the front set being positive and the second negative, or inversely. By superposing upon this system the ordinary circular radiation, this latter can be made either positive or negative. Therefore it will annul the wave of the contrary sign, while it reinforces the wave of the same sign, and the waves from the rear, for instance, will be cut off. The station thus arranged will send or receive the waves from the front side alone. This combination is realized in practice by the simple use of a third vertical antenna. By turning the goniometer, it is seen that any side of the station can be made the front side from which the waves proceed or in which they are received.

POWER PROJECTS ON DRAINAGE CANAL EXTENSION

The International Improvement Commission of Illinois, which has issued a circular asking votes in favor of the proposed $20,000,000 bond issue to be used in constructing a waterway from Lockport to Utica, Ill., declares that the plan is of the utmost importance, inasmuch as it will provide an important link in the deep waterway from the lakes to the gulf. The matter will come up before the voters on November 3d as an amendment to the constitution permitting the bond issue.

The present Drainage Canal extends 29 miles from the South Branch of the Chicago River in Chicago to the city of Lockport, where it connects with the Desplaines River. There is a further extension of 1¾ miles to the power house between Lockport and Joliet, which utilizes a drop of 38 feet. Here three 4,000-kilowatt generators are now in operation, a fourth is in process of erection and four more are to be installed.

ONE END OF NEW YORK ELECTRICAL SHOW, SHOWING EXHIBIT OF GENERAL ELECTRIC COMPANY

The new waterway as planned will start at the end of the present Drainage Canal at Lockport and will end with a lock into the Illinois River. Four power plants would be erected, with a gross estimated horsepower of 140,000 developed from the water.

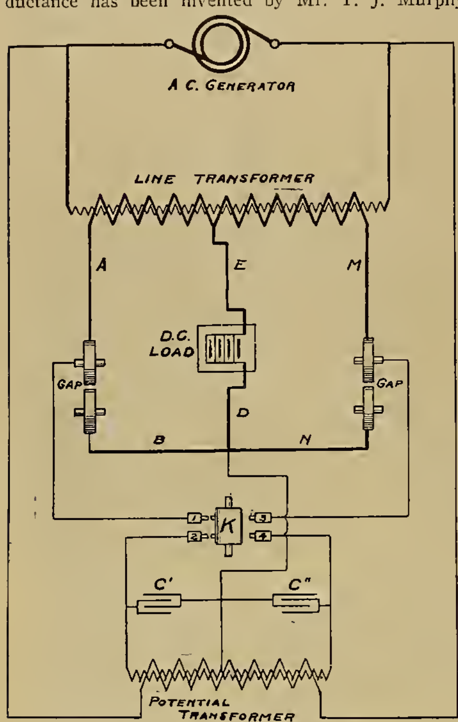
The following is the commission's outline of the general plan of the waterway:

Starting at the Sanitary District power house below Lockport and 36 miles from Lake Michigan, it is proposed to lock down into the Joliet pool level through a lock with a 34-foot lift, and to continue this level through Joliet to the head of Lake Joliet at approximately mile No. 42. At this point will be located the first waterpower development, with a head or fall of 24 feet, and a gross horsepower available of 38,182 with the ultimate flow of 14,000 cubic feet per second. Lock No. 2 will carry the waterway through this 24-foot fall into the next level, which extends for 14 miles to a point just below the mouth of the Kankakee River (the head of the Illinois River, which is formed by the junction of the Desplaines and Kankakee), where, at mile No. 56, will be located the second power plant with an available head of 18 feet, and a waterpower potential of 28,636 gross horsepower. Here the waterway is carried through lock No. 3 down the fall of 18 feet into the next level, which extends for 27 miles to a point about three miles below Marseilles, where at mile No. 83 will be located the third power plant with an available head of 26 feet and a waterpower potential of 41,364 gross horsepower. Here the waterway is carried through lock No. 4 down the fall of 26 feet and into the next pool level, which extends for

14 miles to a point just above the Utica wagon bridge, where, at mile No. 98, will be located the fourth and last power plant with a head or fall of 20 feet and a waterpower potential of 31,818 gross horsepower. The waterway is carried through a lock at this point down the 21-foot fall into the Illinois River at La Salle.

A NEW TYPE OF RECTIFIER

An alternating-current rectifier which differs entirely from devices designed for a similar purpose and utilizing either a vacuum, an electrolyte or inductance has been invented by Mr. T. J. Murphy



NEW TYPE OF RECTIFIER

of Rochester, N. Y., and was exhibited in service at the New York Electrical Show. In brief, its operation depends upon the familiar principle that if an air-gap be bridged by a potential sufficient to form a spark a lower potential dynamic current may flow over the path of hot gases so formed just as over any material conductor. This phenomenon of a power current following the high-potential discharge is familiar in certain types of lightning arresters where precautions must be taken to prevent the heavy flow of line current across the gap bridged by the ligtning potential. Mr. Murphy has ingeniously utilized high-potential discharges to serve as paths for switching his power currents to be rectified, using the circuit arrangement illustrated herewith.

From the alternating-current line two transformers are supplied, as shown, the upper one in the diagram being the line transformer and the lower one, described as a "small specially constructed transformer," furnishing the potential for bridging the gap. A synchronous motor working in step with the line alternations drives the rubber or insulating commutator K at the speed of the generator frequency. The commutator carries a pair of connected spark points which move in line with the electrodes *1*, *2* and *3*, *4*. Also on the motor shaft are the rectifying disks connected in the heavy-line circuit and forming the slight gaps marked. The direct-current load is inserted at the point shown by the storage battery.

To start the apparatus the synchronous motor is just brought to speed by cranking and a switch controlling the circuit of the small potential transformer is closed. The rectification of the alternating-current supply and its delivery to the storage battery as a unidirectional flow is as follows:

When the points on the commutator K are opposite the electrodes *1* and *2*, the condenser C' discharges across the gaps at *2* and *1*, through the air gap at the rectifying disks, through B, returning to the other side of the condenser C'. With the bridging of the gap between the disks the line current follows the spark across the gap, flowing down A, through B, up D to the direct-current load and through E to the winding of the transformer. At the next alternation or half cycle the commutator points will be opposite *3* and *4*, and C'' will discharge similarly to C', bridging the gap between the rectifying disks on the right-hand side. Similarly the power current will flow down M, follow the spark across the gap, cross N and flow up D through the direct-current load in the same direction as before and to the transformer winding.

The contact points *1*, *2* and *3*, *4* are mounted on a rocker-arm capable of being placed at any angle about K so that the condenser discharge can take place at any point of the impressed voltage wave. Thus the direct-current voltage can be regulated through a wide range in fine graduations—from a fraction of a volt to the limit of the wave. This latter advantage secures any desired voltage for a storage battery or other load without wasteful voltage drop across resistance. The inventor claims a maximum efficiency of 90 per cent. for his rectifier.

DESIGN OF THE ILLUMINATION OF THE NEW YORK CITY CARNEGIE LIBRARIES[1]

By L. B. Marks

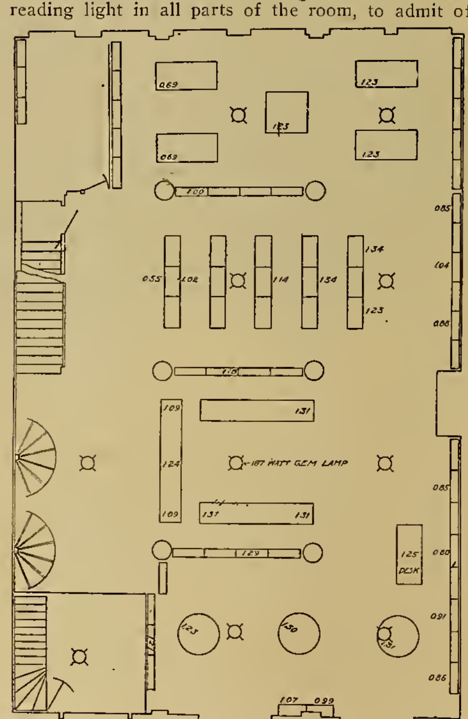
The design of the illumination of a public library involves considerations which are quite unlike those that ordinarily confront the illuminating engineer, and are in many respects more difficult to meet than in almost any other class of buildings. The design must secure:

(1) Sufficient illumination on the reading tables and book shelves to meet the demands of a wide class of readers of various ages and conditions of eyesight, taking into account the fine print in some of the books and the difficulty of reading titles of books in position on the shelves. Some of the books are worn by frequent handling, and the titles become more or less obscured.

(2) Low intrinsic brightness of light sources and freedom from glare, and so far as possible removal of lights from the ordinary field of vision.

(3) Sufficient illumination for the library staff to oversee the entire floor.

(4) Sufficient illumination to provide a moderate reading light in all parts of the room, to admit of



GENERAL ILLUMINATION OF THE FIRST FLOOR, CARNEGIE LIBRARY

the relocation or addition of furniture, such as portable magazine filing racks, etc.

(5) Moderate cost of installation.

(6) Economy of operation. This must take into account not only the system of illumination and type of lamps used but also the switching arrangements.

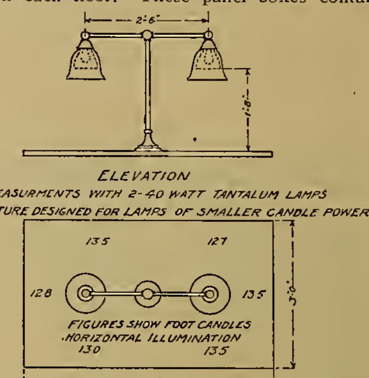
(7) Simplicity in construction and convenience in operation. This must take into account the character of help in local charge of the equipment.

(8) Esthetic design of fixtures and attractive appearance of the reading rooms at night.

The present paper deals with the design of illumination of the new Carnegie branches of the New York Public Library, and in particular with the St. Gabriel's Park branch which is representative of seven other Carnegie library buildings which are now under construction in New York city. This branch was opened to the public a few months ago.

[1] Abstract of a paper presented at the convention of the Illuminating Engineering Society, Philadelphia, October 6, 1908.

The light units are designated at each outlet on the basis of 50-watt units. The lighting service is taken from the direct-current three-wire mains of the New York Edison Company and enters the building in the basement from which it is distributed throughout the building through panel boxes located on each floor. These panel boxes contain



ILLUMINATION OF RECTANGULAR READING TABLES, CARNEGIE LIBRARY

the switches which control the individual circuits.

The basement contains the packing and receiving room, boiler room, coal vault, store room and lavatory. The walls and ceilings of this room are white in color.

The main entrance to the building is on the first floor. With the exception of the vestibule and small office, which are separated from the rest of the room by glazed partitions, this floor constitutes one large room. In the front of the room is the circulating department, in the middle the application and delivery desk, and in the rear portion the free standing book stacks and the reference room. These departments are separated from each other by low rails or low bookshelves. Along the walls of the room are bookcases about seven feet high. The walls are cream color and the ceiling white. The public has access to all of the bookshelves. In the entrance hall are located two exhibition racks of the swing frame type. The switches for controlling the lights are in charge of the librarian.

The second floor contains the children's reference room and circulating department and the librarian's room. The conditions are very much the same as on the floor below.

The main reading room and the janitor's apartments are on the third floor. In addition to the reading tables in the main room there are two circular seats for readers around the columns; also two exhibition cases for the display of photographs, prints, etc. The room contains portable magazine and newspaper racks but has no bookshelves.

The roof is used as an open-air reading room. The floor is of dark-colored tile, the walls red brick, and the ceiling formed by a roof of dark-colored tile supported on trusses.

Tests of illumination were made under my direction by the Electrical Testing Laboratories, on the first floor and in the roof reading room.

The first floor dimensions are approximately 67 feet by 44 feet, and the height of the ceiling is 15 feet 3 inches in the clear. General illumination is provided by ten 187-watt ceiling pendant lamps, each equipped with a prismatic reflector, both lamp and reflector being enclosed in a 16-inch crystal globe roughed on the outside. The height of the lamps above the floor is 12 feet 6 inches. The localized illumination is provided on the reading tables, stacks, bookshelves, etc., and may be used in whole or in part, depending upon the requirements, permitting lamps to be extinguished when not required.

The free standing bookcases located near the rear of the room are 52 inches high and 9 feet 6 inches long, divided into four shelves nine inches apart. These are illuminated by 50-watt Gem lamps, backed by prismatic reflectors, which are covered by opal shades, green on the outside. These are located 6 feet 6 inches above the floor and immediately over the center of the aisles between stacks.

The seven-shelf bookcases upon which tests were made are illuminated by special two-socket mirror trough wall reflectors holding the lamps in a horizontal position and equipped with 50-watt Gem lamps. Tests were made upon the low bookcases along the aisles. These cases are provided with three-candlepower carbon-filament incandescent lamps on swing brackets, which, when in use, extend nine inches beyond the edge of the case, but when out of use are swung over the top of the rack in order to leave maximum aisle space. These lamps are 44 inches above the floor and six inches above the top of the case. They have opaque metal reflectors.

The round reading tables are provided with 40-watt frosted tantalum lamps in single lamp fixtures having 14-inch opal dome shades, green on the outside. Immediately over the lamps and inside the dome shades are placed prismatic reflectors. These fixtures are placed at the centers of the tables, with the tantalum lamps 20 inches above the table top. The rectangular tables, three feet by five feet, in the rear of the room, are illuminated by frosted 16-candlepower Edison lamps, equipped with reflectors of the same type as those used on the round reading tables.

In the roof reading room 125-watt tip-frosted Gem lamps are used in conjunction with a temporary installation of prismatic reflectors sand blasted inside. The tables are not fixed as in the floors below.

Most of the lamps in this installation were installed over two months ago and have experienced a normal amount of service since installation. As slight fluctuations in voltage were to be anticipated, and as it was desired to obtain results which would be free from the influence of such fluctuations, it was decided to make the photometric comparisons with a standard lamp operated from the lighting system and subject to the same fluctuations in voltage as were the lamps under test. Under these conditions accurate results are secured which are intercomparable.

On the first floor tests were made to show the amount of general illumination and also to show illumination produced by both the ceiling lamps provided for general illumination and the lamps provided for local illumination. The intensity of vertical illumination was measured at points on the fronts of stacks and bookshelves where it is desired to read titles on the backs of books. Tests were also made of horizontal illumination in aisles immediately in front of stacks to show illumination on books opened and held in such positions for casual inspection. Other tests of horizontal illumination were made upon reading tables.

In conducting these tests a Sharp-Millar portable photometer was used. In tests of vertical illumination at the book stacks the photometer was placed on the shelves with the illumination test plate vertical, and in the position occupied by the title of a book. An observation under these conditions is equivalent to viewing the title from a point directly in front or to viewing the test plate from a point in a line normal to its surface. Other tests of the same values were made by placing a piece of blotting paper (used as a test plate) vertically over the backs of the books, and observing it through the photometer located at the point from which one would naturally view the titles of the books in practice. This constitutes a determination of the illumination intensity through observation of the test surface at angles varying from 45 degrees above to 40 degrees below the normal, depending upon the height of the shelf.

In all cases the illumination is stated in terms of that produced by a standard lamp placed at a known distance from the test plate which was viewed as in the test.

Results of tests of general illumination in all the principal working positions in the room are shown in foot-candles on the accompanying chart. The measurements were made on a horizontal plane approximately three feet above the floor. The average of all values is 1.1 foot-candles. Data for the first floor are as follows:

Area, square feet	2,950	
Contents, cubic feet	44,950	
Watts, general illumination		2,316
Watts, localized illumination		4,174
Total watts		6,490
Watts per square foot general illumination		0.78
Watts per cubic foot general illumination		0.05
Average foot-candles on horizontal working plane		1.1
Foot-candles per watt per square foot		1.4

On the seven-shelf wall bookcases the foot-candles illumination as measured on vertical white blotting paper is shown in an illustration, the figures underlined representing the foot-candles, and their location on the diagram indicating the location of the test plate on the bookshelves. Measurements were made to determine horizontal illumination in front of the bookshelves. These values are indicated on the diagram in figures inscribed in rectangles.

A plan of one of the rectangular reading tables, showing the location of the two lamps which provide local illumination, is given. Horizontal illumination values are shown upon the diagram, the angle at which the blotting paper was viewed from the photometer, being in each case approximately 45 degrees above the horizontal.

First Floor

Roof Reading Room

VIEWS IN THE CARNEGIE BRANCH LIBRARY

Features of the design are the following:

(1) Freedom from glare. No unshaded lamps. Intrinsic brightness of lighting sources, 1/10 of a candlepower per square inch.

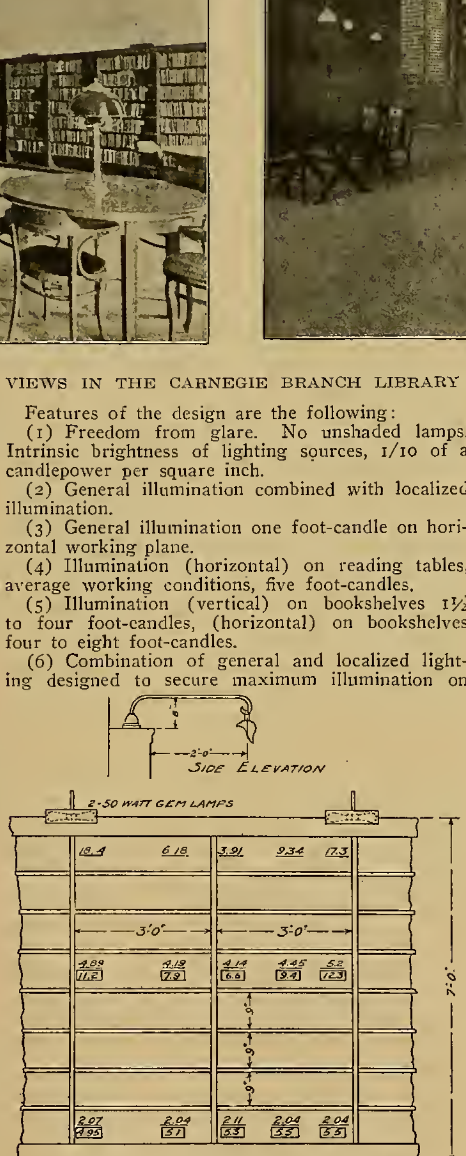
(2) General illumination combined with localized illumination.

(3) General illumination one foot-candle on horizontal working plane.

(4) Illumination (horizontal) on reading tables, average working conditions, five foot-candles.

(5) Illumination (vertical) on bookshelves 1½ to four foot-candles, (horizontal) on bookshelves four to eight foot-candles.

(6) Combination of general and localized lighting designed to secure maximum illumination on



ILLUMINATION OF WALL BOOKCASES, CARNEGIE LIBRARY

the working spaces at minimum cost of operation for the required results. Ceiling pendants for general illumination designed for efficient use of tungsten lamps.

(7) Flexibility. Design of switching arrangements for economical use of light. Lights near windows placed on same circuits so far as possible.

(8) Lamps for general illumination hung high but low enough to avoid sharp contrasts on the ceiling.

(9) Lamps for general illumination enclosed in 16-inch crystal glass globes roughed on the outside.

(10) Lamps for table lighting provided with prismatic reflectors designed to throw the maximum light sideways instead of downward. Frosted lamps used.

(11) Lamps for lighting low bookshelves screened from view by opaque parabolic reflectors. Lamps for lighting wall bookcases, backed by opaque trough reflectors.

(12) Lamps for lighting free standing bookcases and reading tables screened from view by green plated glass domes.

(13) Lamps for lighting exhibition racks screened by reflectors with green celluloid covers.

(14) Wall bracket and column bracket lamps provided with deep enameled glass diffusing shades of sufficient depth to hide the lamp. Frosted tip lamps.

(15) Cheerful appearance of rooms.

OZONE FOR HOSPITAL USE

The Pittsburg (Pa.) Homeopathic Hospital sterilizes 100,000 gallons of water daily by the use of electrically generated ozone. Sixty-cycle, single-phase current at 110 volts is supplied to two transformers of one-kilowatt capacity each and delivering 10,000 volts. There are five ozonizers having a combined capacity of 250,000 gallons each 24 hours; three are used for water sterilization, while two furnish ozone for sterilizing instruments and bandages. Ozone admitted to the wards seems to have a beneficial effect on the patients, making them more cheerful, stimulating their appetites and inducing sound sleep.

The method of sterilizing the water was devised by Dr. Leon Gerard. Dried air is first passed through the ozonizers and is then mixed with the water through an injector. The mixing is continued by passing the water up through a tower containing a number of perforated trays. Any free ozone is removed at the top of the tower before the water overflows to the tank from which it is distributed. The water has a slightly milky appearance at first, owing to the entrained air, but this soon disappears. The apparatus is said to require but little attention and the cost is about 25 cents a day.

PAINLESS SLAUGHTERING OF CATTLE BY ELECTRICITY

Satisfactory experiments in the electrocution of animals for food consumption have been made within the past year by Dr. Stephane Leduc, of the Medical School of Nantes, France, writes the American consul, Louis Goldschmidt, stationed at that city. During the course of some researches made by Dr. Leduc with a view of causing electric sleep, he discovered this new and rapid method of inflicting painless death, a method which is very simple and inexpensive. Low voltage direct-current is passed through an interrupter and delivered as a pulsating unidirectional flow. In an animal submitted to this current the functions of life, circulation, respiration, etc., are stopped and a perfect and general insensibility is produced, while none of the essential organs is injured. If the current is stopped before two minutes have elapsed, life is restored again and the animal does not appear to have suffered from the experiment. An animal subjected to this current for more than two minutes dies without pain from asphyxia. One electrode is placed upon the forehead between the eyes and the other is placed at the extremity of the spinal column so as to concentrate the current through the brain and spinal marrow. Owing to the great contraction of the muscles the bleeding is very profuse, and consequently the meat is supposed to be of better quality.

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

MR. E. H. HARRIMAN has telegraphed to the Chicago Tribune, in response to a request for a statement in relation to the electrification of railroads, to say that he believes electricity will have to be used for the most important suburban lines; "but," he adds, with the caution of a man of large affairs, "it is too early for me to make a definite commitment." In view of the fact that Mr. Harriman is the court of last appeal in the Illinois Central organization, this statement, vague and general as it is, is significant and important. Undoubtedly the Illinois Central people have become convinced that the electrification of their railroad system in Chicago is inevitable. They now seem to be seeking to make the best possible terms for themselves in relation to the extent of the improvement and the time set for it to go into effect. These are important questions, and now that public sentiment is thoroughly aroused the city authorities should insist on a thorough electrification within the city limits, both for through trains and suburban service, and set a reasonably short time limit within which the work must be accomplished.

CHARACTERISTIC of the modern engineer's advanced methods of analyzing a problem is the investigation reported in the paper of Messrs. P. Junkersfeld and E. O. Schweitzer on "High-potential Underground Transmission" that was presented before the American Institute of Electrical Engineers on October 9th and which is abstracted, with the subsequent discussion, in this issue. Although cable burn-outs are now rare, reliability of service and the cost of repairing defects make it imperative to search carefully for the causes of all cable breakdowns, so that they may be entirely eliminated. The employment of spark-gaps and of the oscillograph in making these researches is a distinct sign of progress in that these devices, lately confined to the advanced laboratory, where careful and delicate adjustments may be expected, are now coming into use by operating engineers for the scientific analysis of the perplexing phenomena of internal surges of a cable system.

It is gratifying to note that the performance of high-tension cables is now quite satisfactory and that there are prospects of still further improvement when, after the weaknesses in the cable itself and especially in the splices are minimized, the introduction of the aluminum-cell arrester will eliminate practically all danger from the phenomena that Dr. Steinmetz calls "internal lightning." When this is attained, we may expect to see the present 25,000-volt limit much exceeded, even by perhaps 100 per cent.

IN STUDYING the electric-heating proposition plant managers may find much valuable information in the paper on "Electric Heating in Sault Ste. Marie," written for the recent Michigan convention by William Chandler and D. B. South. Mr. Chandler, who read the paper, was quite candid. "While in a great many respects the experiment has not proven a phenomenal success," he said, "we believe in its future and propose to continue to advocate electric heating and cooking for the educational good it has done and will do our current-purchasing public." And further: "We found very many prospective users of the new method who were ready to accept our statement that electricity at 2½ cents per kilowatt-hour is as cheap as gas at $1 per thousand. We also discovered that it was not the cost of operating the apparatus, as we had been led to believe, that held the business back from us, but rather the initial cost of the heating units and the installation of the same, with the necessary special wiring."

On the subject of electric flatirons the authors were more enthusiastic. The business is desirable, with no increase of investment in machinery or transformers. Any plant not now having a 24-hour schedule can afford to operate one day in the week by securing the available flatiron business in its town. This is by no means a new idea, as Mr. Chandler understands that it has been done with the best results.

In conclusion, the authors have this to say: "While we are not entirely satisfied with the electric-heating situation as it appears today (and we venture to say that there are other representative central-station men who will voice the same sentiment), we certainly must not condemn it by any means now, as it has already performed wonders in an advertising way for the entire electrical business and also very largely along educational lines. We must remember the low efficiencies and high cost of incandescent lamps of a few years ago and remember the high efficiencies of the lamps as we are securing them today. We can formulate from such comparison what we may reasonably expect to do with electric heating as it will advance in the future."

Mr. Chandler called on the manufacturers to supply heating apparatus having higher efficiency, longer life, costing less and being more nearly fool-proof. He was assured at the convention that many of the improvements he desired were embodied in newer types about to be announced by the manufacturers.

DISCREPANCIES exist in the nomenclature of electrical practice as expressed in the English language, according as that language is used in Great Britain or America. Compared with the substantial agreement of the use of electrical terms in England and the United States, the differences are really slight; but, as in the use of words relating to other arts and sciences, the terminology used by English-speaking electrical men on the two sides of the Atlantic is not exactly the same. These occasional divergences can be noticed in a list of definitions of electrical terms prepared by the sub-committee on nomenclature of the British committee of the International Electrotechnical Commission, a portion of which list has been published.

Thus "alternator" is given the common meaning attached to the term in the United States, but the word "dynamo" should be reserved for "continuous-current generator," while a "generator" may be either an "alternator" or a "dynamo." In this country, although "dynamo" is less frequently used than formerly, particularly as applying to large machines, it is practically synonymous with "generator," as it should be as a contraction of the original "dynamo-electric machine," which is a broad term.

"Board of Trade unit" for "kilowatt-hour" is, of course, entirely English. Here, perhaps, concerted action might be had by substituting the proposed "kelvin" for both. It is to be observed that the expression "unit" is officially used for "Board of Trade unit." This is short enough, but one would think that some confusion might be caused between units meaning kilowatt-hours and units meaning individuals in a series of generating machines in a power house, for example.

Among the abbreviations included in alphabetical order in the sub-committee's definitions is "B. W. G.," but "B. & S. G." is omitted. A definition that will be new, perhaps, to American readers is "carcase:" it signifies "the assembled pole cores, pole pieces and yoke or frame" of a generator or motor. A slight difference will be noted in "choking coil," which seems to be preferred to "choke coil."

"Direct current" is not recommended; "continuous current" is the term. This is, of course, at variance with the usual American practice. "Ground" is in the list, but is explained as a term used in America having practically the same meaning as "earth." "Electrocution" is defined; apparently the word has obtained a recognition in England which American purists are loth to give it. "Fourth rail," an expression analogous to "third rail," but seldom heard in this country, is not approved; "conductor rail" is the correct term.

It is to be understood, of course, that this series of definitions is tentative; it has not been approved by any authoritative body; but it nevertheless is of much interest as showing the attitude of a committee of British electrical engineers of the highest standing on the subject of nomenclature. Perhaps an effort to harmonize the slight differences in English and American terminology will be made at this month's International Conference on Electrical Units and Standards in London, although the general purpose of this gathering is of a rather different nature.

THE STREET-RAILWAY CONVENTIONS

Monday, October 12th, was the first day of the 1908 conventions of the American Street and Interurban Railway Association and its subsidiary organizations at Atlantic City. The weather was delightful and bracing, and there was every indication that the conventions during the week would be very successful. It was expected that the attendance will be largely increased on the following days of the meeting. The total registration of delegates to all the various meetings was 450 up to five o'clock Monday afternoon. The arrangement of the exhibits on Young's Steel Pier is all that could be desired, the disposition and decorations of the booths being of the most satisfactory character.

The afternoon was devoted to the first session of the new Transportation and Traffic Association, and about 100 street-railway transportation managers were present. The president, C. Loomis Allen of Utica, N. Y., delivered his address. He said that the work of the American Street and Interurban Railway Association will in the future undoubtedly be confined very largely to questions of policy and public relations, including national, state and municipal governments, and to such other matters as only the chief executive officers would be interested in. The Transportation and Traffic Association has a large field of work, and it will require in the future the expenditure of more energy, more time and more money, if the greatest results from this fertile field are to be produced.

There was a discussion of constitution and by-laws, in which John I. Beggs of St. Louis and other participated. After other general business the paper by Ernest Gonzenbach of the Sheboygan (Wis.) Light, Power and Railway Company, entitled "How Can a Small Road Best Promote Traffic and Increase Its Revenue," was read by J. H. Pardee. In the ensuing discussion C. A. Sylvester of Boston, D. A. Haggerty of Little Rock, Ark., T. W. Passailaigue of Charleston, S. C., H. A. Davis of Nashville, Tenn., J. D. Dozier of Lynn, Mass., P. G. Gossler of New York, G. W. Parker of Detroit, Mr. Beggs and others took part. Adjournment was then taken until Tuesday morning.

The main report of the week's meetings will be given in the next issue of the Western Electrician.

PROGRESS IN NEWFOUNDLAND

Boston capital has become interested in modernizing the city of Twillingate, Newfoundland, and as the initial step will establish a plant for electric light and power. This will be the third plant of the kind in Newfoundland. Conditions at Twillingate are peculiar, for at the present time the only light is furnished by kerosene oil, sold at 25 to 35 cents a gallon. There is no gas and no likelihood of ever having it.

The city has a population of above 11,000 within a radius of four miles, and the plant will start with about 6,000 lights, including 500 street lights. The charter of the Twillingate company is direct from the government and covers the entire district, which embraces an area of about 40 square miles and contains a population of over 72,000.

The plant will consist of two units—250-kilowatt steam turbines—it not being considered wise to depend upon the waterpower at hand, in view of the recent experience of the St. John's company. The plant is being installed under the supervision of Mr. Frederick S. Palmer of Boston, who is president of the company, and who has associated with him several well-known Boston and Newfoundland financiers.

ELECTRIC CLUB OF CHICAGO

At the regular Wednesday noon luncheon of the Electric Club of Chicago, held in the grill room of the Automobile Club on October 7th, Mr. C. S. Howlett gave an account of the Deep Waterways Convention in session in the city during the week. His talk was followed by several addresses, rendered with the aid of a phonograph, by prominent party candidates for the presidency. This feature proved a lively innovation for the meeting. The luncheon meeting of October 14th was addressed by Mr. W. J. Warder, Jr., on the subject of "Direct-current Motors for Elevator Service."

ILLUMINATING ENGINEERING SOCIETY

The second annual convention of the Illuminating Engineering Society, held at the Hotel Walton, Philadelphia, October 5th and 6th, was a great success in every sense. The weather was ideal, and the final registration reached 400, almost double that of last year's convention at Boston.

The first meeting, Monday morning, was welcomed in a cordial address by Mayor Reyburn through his private secretary. Dr. Louis Bell of Boston delivered the president's address, his subject being "Some Principles of Street Illumination." The report of the committee on nomenclature and standards followed. An account of the first session was given in last week's issue of the Western Electrician.

Monday afternoon was given over to viewing the military parade, a feature of the Founders Week celebration then being held in Philadelphia and marking the 225th anniversary of the city.

The second session of the convention was held on Monday evening. In order to save time each speaker was allotted five minutes to present the salient points of his paper, after which general discussion was invited. The first paper presented was one on "Modern Gas Lighting Conveniences," by T. J. Litle, Jr., in which he described the methods of controlling gas lights from a distance. Dr. A. H. Elliott followed with a paper on "The Illuminating Value of Petroleum Oils," which was of chief interest to the gas men present, and dealt principally with the use of a certain oil burner as a secondary standard in gas photometry.

H. Thurston Owens' paper on "Street Lighting Fixtures, Gas and Electric," was illustrated by lantern slides showing many different styles of equipment used in Europe and America. He observed that greater attention was given by Europeans to the matter of artistic lamp posts. Many of the photographs, however, were evidently of posts in Philadelphia, which fail to represent fairly the best American practice. "Structural Difficulties in Installation Work," by James R. Strong, created considerable discussion. According to the author, the modern high-efficiency units are doing much to lessen structural difficulties. Especially in the case of large offices, it is coming to be common practice to provide sufficient general illumination, so that individual floor lights are not required. This of course does away with many complications in wiring. The use of moldings was suggested, so that taps could be taken off at will. This, however, was deprecated as a step backward, the best practice being iron conduit.

A change in the order of the program brought Francis E. Cady next with his paper on "The Relation Between Candlepower and Voltage of Different Types of Incandescent Lamps." The discussion of this paper was unsatisfactory in that no definite conclusions were reached. Much data have already been given along these lines, and the performance of the various illuminants on varying candlepower is pretty well established.

At the next session, held Tuesday morning, the first paper given was that of Leonard J. Lewinson, the subject being "The Intensity of Natural Illumination Throughout the Day." The author pointed out that much is said about various illuminants resembling daylight. But the fact is that the quality of daylight varies greatly with the season of the year, the condition of the atmosphere, time of day, etc. There is not at present a standard of daylight. The present paper is a step in the right direction; however, it is not complete enough to give sufficient data to establish a standard of daylight. A point of considerable interest brought out from the data given was that the intensity of illumination on a bright day is such that the density of light reflected from a piece of white paper is as great as that given off by a Welsbach mantle.

According to the paper, in the early hours of the day, an intensity of illumination of two foot-candles is not sufficient to read by. This is rather strange, for, ordinarily, an illumination of that intensity is sufficient to read quite comfortably. As the observers had not been taking many readings at the time, the result cannot be charged to tired eyes. It would seem therefore that such greatly diffused illumination requires a greater intensity than when a more direct method of lighting is used. The data given in this paper emphasized the fact that the eye is a marvelous instrument, which can adapt itself to variations in illumination from a fraction of a foot-candle to 10,000 foot-candles or more.

The next paper was by Dr. Clayton H. Sharp and Preston S. Millar, the title being "The Integrating Sphere in Industrial Photometry." This instrument is very useful in practical work for measuring the mean spherical candlepower of light sources. It is especially applicable to the measurement of arc lamps, for the "traveling" of the arc does not affect the accuracy of the instrument. It is also useful in measuring the mean spherical candlepower of light sources which give an uneven distribution of light. One of the advantages of the instrument is its possibility of use in the open, no dark-room being required.

An interesting device brought to the attention of the convention was the Ives colorimeter in a paper by Dr. Herbert E. Ives. The author says: "As has long been known, spectral red, green and blue light mixed in various proportions will reproduce to the eye all the hues met in nature. This fact, hitherto made use of in the scientific laboratory for the study of color sensations, and applied commercially in the practice of trichromatic photography, has not before been utilized in the practical measurement of color. By means of the colorimeter it is possible to describe a color accurately in terms of the red, green and blue components of a standard white light. For instance, in place of the indefinite term 'pink,' a color may be designated as—red, 62; green, 31; blue, 50. These figures mean that by mixing red, green and blue light in the proportions given there is produced to the eye the sensation of pink."

This fact is taken advantage of in the colorimeter, and by its use any shade can be definitely described in a formula giving the proportional parts of the three primary colors. In using this instrument the author took what he considered average daylight in making comparisons. As there is no standard of average daylight at the present time, such a standard will have to be adopted before the instrument can have its most general application. All agreed that the instrument is a valuable contribution to the art, but the accuracy of the figures given in the paper wherein the color values of various light sources were measured was not accepted. Possibly the particular value of the standard of average daylight used accounted for the peculiar combinations given.

The next paper, entitled "Calculating and Comparing Lights from Various Sources," was then abstracted by its author, Mr. Carl Hering. In the discussion the definition of some of the fundamental terms given was criticised by Dr. Sharp. When two such authorities differ so widely in fundamentals the only conclusion to be drawn is that the terminology of illuminating engineering is yet in a very unsatisfactory state to say the least. A part of the difficulty lies in the fact that the Geneva convention which has defined many terms was not sufficiently representative to make its findings generally accepted.

In the discussion of the measurement of illumination Dr. Bell observed that although the law of inverse squares holds strictly true only when the light source is a point, if the measurement is taken at a distance from the source, at least five times the luminous area, calculations by the simple law hold true.

The afternoon session was called to order at half-past two. Messrs. J. R. Cravath and V. R. Lansingh's paper on 'The Calculation of Illumination by the Flux of Light Method," as abstracted, was well received, and the suggestions it contained were thought valuable. The tables given are useful. In the matter of all computations dealing with illumination there is much opportunity for the exercise of judgment in the matter of estimating the value of walls, ceilings and floors as reflecting surfaces, etc.

E. N. Wrightington's paper on "Street Lighting with Gas in Europe" followed. The next paper, by L. B. Marks, "The Design of the Illumination of the New York City Carnegie Libraries," is presented in abstract in this issue of the Western Electrician.

Mr. Alfred A. Wohlauer's paper on "Engineering Problems in Illumination" aroused some discussion Exception was taken to his statement that the illuminating engineer "must disregard every other limitation but practicability, efficiency and economy." Illuminating engineering, it was urged, in its application is as much, if not more an art than it is an exact engineering science, and as such it was not thought requisite that efficiency and economy should be the only results sought. The design of the scheme of illumination and the housings of the illuminants must be in keeping with the surroundings, even though it may be necessary to sacrifice something in economy to secure the desired results.

The next paper was entitled "Intrinsic Brightness of Lighting Sources," by J. E. Woodwell. The importance of requiring low intrinsic brilliancy in light sources which come in the line of vision is coming to be generally recognized. A point of importance brought out in the discussion was to the effect that an intrinsic brilliancy allowable under some conditions would not be permissible under others. In a room dimly lighted the intrinsic brilliancy must be much lower than in a well-lighted room. Thus a Welsbach mantle may be looked at with impunity placed in the sunlight, but if in a dimly lighted room this would be almost painful.

T. W. Rolph presented a paper, entitled "Some Experiments on Reflection from Ceilings, Walls and Floors," the work of V. R. Lansingh and himself. While the coefficients of reflection of various colored surfaces are pretty well known the resultant illumination to be expected from various combinations of different colored walls and ceilings is very difficult to determine accurately in advance by calculation. The experiments given in this paper are therefore very timely and the data will prove valuable. The official program was concluded with a paper by Emile G. Perrot, on the subject of "Architecture in Illumination." The paper was well received. No action was taken, however, on his recommendation to have a committee appointed to collect and compile data.

The final event on the convention program was a vaudeville entertainment given in the ballroom of the Walton Tuesday evening. All the delegates and guests were invited to enjoy the excellent program. A number of especial merit was given by the Carlisle Indian band in native dress.

An exhibition was given on the top floor of the Hotel Walton. A conspicuous feature was the display of the Philadelphia Electric Company, which had a number of color booths comparing the same goods under different lights and showing the effect of carbon lamps on colored goods. A full line of incandescent lamps included all sizes of tungsten lamps on the market. Broad-carbon arc lamps, using carbons from three to six inches wide—long-burning series lamps for street use—were a feature of the exhibit, which included a line of X-ray reflectors and a Leeds photometer.

Queen & Co. showed a number of Acme miniature arc lamps.

The Nernst Lamp Company exhibited a full line of the latest Westinghouse Nernst lamps and special fixtures.

F. H. Stewart & Co. showed Holophane reflectors and D'Olier shades.

The General Electric Company's booth contained several flaming-arc lamps and a lumichromoscope.

The Cooper Hewitt Company showed a complete exhibit of its latest mercury-vapor lamps.

Frederick Ives exhibited the Ives colorimeter, which was explained to the convention in an address by Dr. Herbert E. Ives.

Foote, Pierson & Co. showed a Sharp-Millar portable universal photometer.

The C. J. Toerring Company had a representative showing flaming arcs for both alternating current and direct current.

The Edward Miller Company had some special five-light fixtures on exhibition.

Among the interesting measuring instruments of the Electrical Testing Laboratories were a flicker photometer, a Kruss Lummer-Brodhun contrast photometer and a Martens photometer.

Ferdinand Keller's collection of historical lamps presented some surprising contrasts to modern electrical illuminants.

The United Gas Improvement Company had a number of objects of interest to the illuminating engineer. In the booth were a flicker photometer, a Carpenter gas standard, some standard candles, a Hefner lamp, some old-fashioned pine knots, several night lights used in Italy, a candle balance and a pentane lamp.

Norman Macbeth showed a flux protractor and some illumination data forms.

The Helion lamp, the filament of which burns exposed to the atmosphere, was installed in the exhibit room. The filament is being perfected by Professor Parker, of Columbia University, and W. G. Clark of New York city.

The Welsbach Company had a very complete exhibit showing its first forms of lamps and its latest improvements in inverted burner lamps. Most noticeable is that in all forms of fixtures and housings; the design imitates as closely as possible the corresponding electric lamp. This is true, especially in the new forms of "arc" lamps, tablestand lamps and fixtures and shades for inverted mantle lamps. J.

THE KANSAS CONVENTION

What is considered the most successful convention in the history of the Kansas Gas, Water, Electric Light and Street Railway Association was the eleventh annual meeting held in Pittsburg, Kan., on October 8th and 9th. Twenty-one new members were elected, and the business sessions were profitable, while the entertainment features—a theater party, a trolley ride and a banquet—were much enjoyed. President C. L. Brown of Abilene presided, and after his opening address papers were read as follows:

"Street Lighting—Arcs and Series Tungstens," N. R. Birge, General Electric Company, Schenectady, N. Y.

"Electrical Jobbers," P. B. Chaney, Monarch Electric Company, Kansas City, Mo.

"The Correct Rate to be Charged by Central Stations," W. A. Scothorn, Hutchinson, Kan.

"Commercial Insulation of Wire," F. H. Dimick, International Lecture Institute, New York, illustrated by lantern slides.

"Finances of the Light Business," H. V. Forest, superintendent Winfield Electric Light Company.

"Steam Turbines," C. R. Mackay, manager Toledo Railway and Light Company, Toledo, Ohio.

"Incandescent Lamps," F. E. Cady, National Electric Lamp Association.

"Our System of Bookkeeping and Records," Dow R. Guinn, Pittsburg Water Supply Company.

"Electric Meters," A. T. Lucas, Wichita, Kan.

On the recommendation of a nominating committee, consisting of R. C. Johnston, J. T. Huntington and W. E. Sweezey, the following-named officers were elected: President, W. A. Scothorn, Hutchinson, Kan.; secretary and treasurer, J. D. Nicholson, Newton, Kan.

Wichita was selected as the next place of meeting on the recommendation of a committee consisting of H. A. Almert and W. A. Scothorn.

INCREASE IN COMMONWEALTH EDISON DIVIDEND

An annual dividend of six per cent. has been declared by the directors of the Commonwealth Edison Company of Chicago. The quarterly disbursement will be 1½ per cent. instead of 1¼ per cent. as formerly made. The payment is due November 2d to stockholders of record October 20th. The company was formed in September, last year, by the consolidation of the Chicago Edison and Commonwealth Electric companies. In the transaction Chicago Edison stockholders were given 160 per cent. of their old holdings in new Commonwealth Edison stock, the extra 60 per cent. representing their interest in the old Commonwealth Electric, which was held for their benefit, but on which no dividends were paid. The present advance in the Commonwealth Edison dividend raises the rate to an equivalent of 9.6 per cent. on the old Chicago Edison shares, which formerly paid 8 per cent.

The annual meeting of the stockholders will be held at noon on November 9th.

The United States Reclamation Service will install an electric power plant at the Corbett dam of the Shoshone reclamation project and promises to supply electricity at cost to the settlers under the project. The homesteaders will be able to have all electrical conveniences on their farms. The reclamation department is also to install telephone lines, and farmers so desiring may have service at a low cost.

QUESTIONS AND ANSWERS

ELECTRICAL UNITS

H. M. L., Shelbyville, Ill.: A friend says that a "primary" ampere and a kilowatt are equal, giving as his reason that generators rated at 300 kilowatts output are also rated to furnish 300 amperes. I maintain that an ampere is not equal to a kilowatt, as they are the units of entirely different quantities.

ANSWER

The kilowatt is 1,000 times the watt or unit of electrical power. The ampere is the unit of current and must be multiplied by the voltage to give the wattage or power. Thus a 110-volt machine furnishing five amperes would be rated at 550 watts or about half (55-100) of a kilowatt. There is then no such equivalent relation between the ampere and the kilowatt as the questioner implies. It happens, however, from the relation explained above between the ampere, volt and watt that a machine generating at 1,000 volts will furnish one ampere of current while it is producing 1,000 watts or one kilowatt of power. In this case the amperes and the kilowatts will be numerically the same for 1,000 volts. As this pressure of 1,000 volts or more frequently 1,100 volts, is a common distribution pressure for alternating-current street mains supplying the primaries of house transformers stepping down to 110 volts, the derivation of his term "primary ampere" may be found. An ampere at 1,000 volts represents a kilowatt of energy, but the ampere, being a unit of current, is as much different from the kilowatt, a unit of power, as a gallon of water per minute differs from a horsepower unless it be allowed to fall through 3,955 feet, the fall being the analogy of voltage drop.

ALTERNATING-CURRENT DISTURBANCE ON TELEPHONE LINE

W. B. K., Spring Valley, Ill.: We have a 1,100-volt, alternating-current circuit running on the inside pins of four-pin cross-arms for a distance of one mile. On the same poles and 26 inches above our line is a metallic telephone lead. When power is thrown on the alternating-current circuit the resulting induction becomes very annoying on the telephone line. Would it help matters to transpose the alternating-current circuit, transpose the telephone lines, or throw the power circuit on the outside pins of the arms?

ANSWER

Make an even number of transpositions about a quarter mile apart on either the alternating-current or telephone circuits. If there are several of the latter, transposition of the power circuit will involve less trouble, and if carried out frequently enough may correct the trouble, but the better plan will be to insure the transposition of the telephone lines. At the same time examine the insulation of the telephone lines both on poles and at stations. Throwing the power wires onto the outer pins will increase the distance from the telephone wires to the disturbing lines but little. Perfect insulation and frequent transposition of telephone lines must be relied upon to remove the noise if further separation of cross-arms or even separate pole lines is not feasible.

DERIVATIVES OF THE VOLT

J. A. H., Bismarck, Pa.: What is a kilovolt? What is a millivolt? What is a microvolt?

ANSWERS.

A kilovolt is a unit of electromotive force equivalent to 1,000 volts, the prefix kilo signifying one thousand. A millivolt is 1/1,000 of a volt, the prefix milli standing for one-thousandth. A microvolt is 1/1,000,000 of a volt, micro meaning very small and therefore being generally used in the naming of units to mean one-millionth. The unit microvolt is seldom used, however. These metric prefixes are generally used in the designation of multiples and submultiples of electrical units, such as kilowatt, milliampere, microhm.

A new electric transmission line has been built in El Dorado County, California, to supply the rapidly increasing demand for power in Sacramento and other towns and cities in that vicinity. A third electric power line has now been installed in Kennett, Shasta County, making that town an important distributing point. A new electric power company has been installed in Yuba City to supply power and lights to Live Oak and Encinal in Sutter County.

ALTERNATING CURRENTS AND THEIR APPLICATIONS

By Edson R. Wolcott

CHAPTER I.—GENERAL PRINCIPLES

Part III.

Measurement

Effective Value of Alternating Current

Suppose a direct current of 0.5 ampere is flowing through a 16-candlepower incandescent lamp under an electrical pressure of 100 volts. In order to produce the same effect with an alternating current, the maximum value of the voltage would have to be about 141 volts, since the alternating current has zero value part of the time. Likewise, the maximum value of the current would be proportionally larger, that is, about 0.7 ampere. These are experimental facts that can be mathematically deduced from the properties of the sine curve already explained.

In measuring alternating currents it is not the maximum value that is determined; it is that value of a continuous current which would produce the same effects. For example, let an iron rod be suspended within a coil consisting of a few turns of heavy wire, as shown in Fig. 10; the iron will

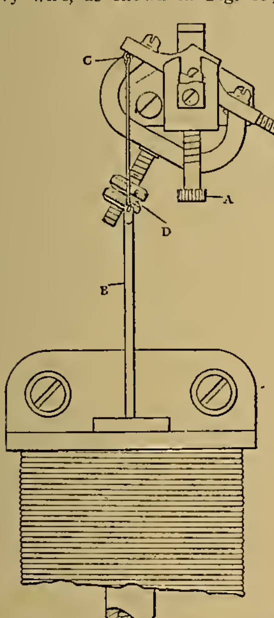


FIG. 10. PLUNGER AMMETER

be drawn into the coil no matter which way the current flows. An alternating current having a maximum value of about 0.7 ampere would draw the iron in just the same as a direct current of 0.5 ampere. The latter is called the effective value of the alternating current.

Ratio of Maximum to Effective Value

The ratio of the maximum value to the effective value of an alternating current is about 7 to 5. To be more exact, it is as follows:

$$\frac{\text{maximum value}}{\text{effective value}} = \sqrt{2} = 1.414.$$

In the curve shown in Fig. 3 (page 249), where the maximum value was 1 ampere, an instrument would have indicated $\frac{1}{1.414}$, or .707 ampere. The same thing holds true in the case of a voltmeter reading and the maximum value. In considering alternating currents effective values are always understood unless otherwise stated.

Voltmeter and Ammeter Construction

The same principles apply to the construction of both ammeters and voltmeters, the difference being that voltmeters are high-resistance instruments, while ammeters have low resistance. An ammeter measures the electric current in much the same way that a water meter measures the flow of water, except that the former is usually an indicating rather than a recording instrument. The electromotive force, or the potential difference, as it is sometimes called, is comparable to the head of water of a stream. The flow of water is proportional to the head, other things being equal, and provided that not enough water is withdrawn to alter the value of the head.

Under this condition the heads of various sources of water can be estimated by comparing the flow. Likewise, an ammeter, if its resistance be large, can be used to measure the potential difference, for then it does not lower the electrical level. This is more clearly shown in Fig. 11, where *G* is a

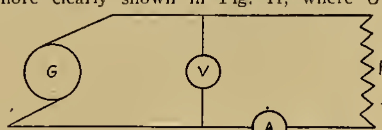


FIG. 11. DIAGRAM SHOWING METHOD OF CONNECTING A VOLTMETER AND AN AMMETER TO A GENERATOR

generator connected to a resistance *R*; *A* is an ammeter connected in series, and *V* a voltmeter connected in parallel with the generator. The electromotive force could not be determined if the voltmeter *V* were a low-resistance instrument, because it would then amount to a short-circuit and would effect the electrical level. Its resistance must be large compared to that of the rest of the circuit in order to have the electromotive force proportional to the current as shown by the expression:

$$E = IR. \qquad (1)$$

Only when the resistance of the circuit is constant does the current remain proportional to the electromotive force. Therefore, the resistance introduced when the voltmeter is shunted across the generator must be so large that it does not materially affect the total current flowing. The instrument can then be calibrated to read volts instead of amperes.

Transmission of Electrical Energy

The energy of an electric current is proportional to the product of the current flowing and the electrical pressure producing it, thus:

$$W = EI,$$

where W represents watts, E the potential difference in volts, and I the current in amperes. By use of the expression $E = IR$ the value of E in the expression above can be substituted, and we then have $W = I^2R$; that is, the energy lost in transmission is equal to the square of the current flowing, times the resistance of the transmission line. The greater the value of I the greater will be the loss. The ratio is as the square; hence a small increase in current causes a considerable increase in loss.

It is also evident that the same amount of energy can be transmitted with a small current, I, provided E be made proportionally larger. Hence, the economy of high-voltage transmission. With alternating-current generators and the use of transformers any desired voltage can be obtained. It then becomes a question of insulation. The voltage can be as high as the insulation will stand. In many cases, however, it is desirable to use the electrical energy at much lower voltage, and transformers are thus inserted at both ends of the line. Those at the generating station increase the voltage and are called step-up transformers; those at the consuming end decrease the voltage and are called step-down transformers.

[*To be continued.*]

Note.—This serial was begun in the Western Electrician of October 3, 1908.

CHICAGO N. E. L. A. BRANCH

Of the new branch associations of the National Electric Light Association the largest is that of the Commonwealth Edison Company in Chicago. Although recently organized, the membership is 356. The officers of the organization are: Chairman, George H. Jones; vice-chairman, J. T. Mountain; treasurer, William Holloway; secretary, L. E. Marshall; executive committee, E. O. Schweitzer, Thomas Walsh, H. E. Addenbrooke.

BOOK TABLE

Thomas Alva Edison. By Francis Arthur Jones. New York: Thomas Y. Crowell & Co. 1908. Pp. (5½ by 8 inches), xii., 362, with 32 illustrations.

Edison's life could hardly fail to inspire the dullest biographer, and Mr. Jones is by no means dull. The sub-title is "Sixty Years of an Inventor's Life," and the author gives an interesting description of the early years of the Grand Trunk newsagent who was to become a great man, following this with several chapters devoted to Edison's inventions and ending with a description of the inventor's home life, his personality and opinions. With no great pretension to technical exactness or finished literary style, the book is written in a chatty, gossipy fashion, with a profusion of anecdotes, and contains a mass of interesting material. It should prove to be a popular "life."

That Edison is the most prolific as well as perhaps the greatest of inventors is shown by the fact that in the United States alone, so far, over 800 patents have been granted to him. These are partially classified, according to the author, as follows: Electric lighting, 169; telegraphs, 147; phonograph, 101; ore-milling machinery (magnetic separator, etc.), 53; telephone, 32; electric meters, 20; storage battery, 20. However, one would think that the number of storage-battery patents should be larger. A chapter is devoted to the storage battery, and it contains an interesting reference to "the huge factories which are going up in Orange for the sole purpose of making the Edison storage battery bear silent witness to the final success of this important invention." The same chapter contains an example of the loose statements which occasionally mar the volume: "It will be readily understood that in the manufacture of a perfect storage battery one of the hardest nuts to crack was the invention of an ideal accumulator or condenser—that portion of the battery capable of containing large quantities of electricity."

It would be easy to find fault with this book, but that would be rather captious criticism, for its good qualities decidedlly outweigh its defects. Some of the anecdotes so freely given are familiar, but many of them are good. One of the best, illustrating Edison's patience and thoroughness, is this characterization, attributed to opposing counsel in a patent suit: "If your honor wished him to, Mr. Edison could go into a field of grass a mile square and select therefrom the most perfect blade."

The illustrations add to the value of the book. One of the most interesting is the facsimile of the Weekly Herald, the little railroad newspaper issued by Edison as a boy of fifteen.

BROOKLYN SECTION OF N. E. L. A.

Realizing the advantages to be gained through membership in the National Electric Light Association, 138 employes of the Edison Electric Illuminating Company of Brooklyn met on October 2d and formed the Brooklyn Company Section of the National Electric Light Association. This meeting was in reality an adjourned session of the one held the week previous, at which time an organization committee was appointed to nominate officers and draw up a constitution and by-laws.

The organization committee presented the following nominations: Chairman, G. L. Knight; vice-chairman, P. D. Sharkey; secretary, E. A. Baily; treasurer, I. Bugg. There is also an executive committee, consisting of 12 members, one from each department of the company. The election of the nominees as presented was unanimous.

It is the intention of the Brooklyn Company Section to meet three times during the year, at which times papers will be presented and discussed, and to hold its annual meeting and company convention as soon as convenient after the National Electric Light Association convention.

THE SAD END OF JOCKO

Jocko, a circus monkey, escaped from his cage at Portland, Ore., on October 8th, and after a chase climbed to the roof of a sub-station, dragging his steel chain across the 10,000-volt transmission wires. The resulting short-circuit put all the electric service in the city out of operation, tying up street cars, elevator motors and electric lights. After a search for the cause of the outage (and here the daily newspapers must be quoted), "the monkey was finally found alive but attached to a solid piece of steel, the electric current having fused his chain. He was badly burned and had to be killed."

HIGH-POTENTIAL UNDERGROUND TRANSMISSION[1]

By Peter Junkersfeld and E. O. Schweitzer

Among the many electrical developments of the day, the most striking one, the most far-reaching in its direct and indirect results, is the successful transmission of energy at greatly increased pressures. From present indications systems operating at potentials of 100,000 volts and over will not be uncommon in a few years, and none dare prophesy what further increase the future has in store. Within the confines of the largest cities the conditions are sometimes such that it is not advisable to carry these high potentials overhead.

The limitations of insulation and size have kept the transmission voltage for underground cables at about one-third that of overhead transmission, and while there has been a considerable advance in the art the approximate ratio of 1 to 3 seems to be maintained. However, in large systems of underground transmission, insulation and size are not the only cable limitations. The line constants may become such that the cable is frequently subjected to dangerously high potentials. It therefore becomes advisable carefully to study the system so as intelligently to provide conditions for reliable service. This brings us to the subject of our paper in which we shall discuss high-potential underground transmission with a view of pointing out some lessons taught by experience and tests and of suggesting further investigation and discussion.

A typical system using high-potential underground transmission extensively is that of the Commonwealth Edison Company of Chicago, and its experience will be cited principally. At present (September, 1908) the system consists of two generating stations (a third is in process of erection) with a maximum capacity of about 18,000 and 100,000 kilowatts, respectively, 66 9,000-volt, three-phase transmission lines aggregating 272 miles, supplying 44 sub-stations containing synchronous converting equipment almost exclusively. Three additional substations and 68 miles of additional 9,000-volt cable are now under construction.

There is also a 20-000-volt line 11 miles long connected to the 9,000-volt system through step-up transformers and feeding railway and frequency-changer sub-stations located in an outer or suburban zone. Forty-four miles of additional 20,000-volt underground lines are under construction, which will bring the total up to 55 miles. This 20,000-volt system will be permanently supplied from 5,000-kilowatt, three-phase, step-up transformers connected delta to star, with the neutral grounded. The standard size of 20,000-volt cable is 00, and of 9,000-volt cable 0000 and 250,000 circular mils. The 340 miles of 9,000-volt cables supplying the densely populated inner zone form a so-called "radial system," while the 55 miles of 20,000-volt cable, when completed, will form two so-called "ring systems," one supplying the more sparsely settled outer zone northward and the other southward. The principal station (Fisk Street) is equipped with steam turbines exclusively, four with a maximum capacity of 7,500 kilowatts each and six of 12,000 kilowatts each. The generators are all star-wound and the neutral is grounded.

In February, 1902, the 25-cycle, three-phase system of about 17 miles of three-conductor cable and seven synchronous-converter sub-stations was raised from 4,500 to 9,000 volts, the equipment and cable having been installed with this change in view. The insulation on the original 4,500-volt cables consisted of 5/32-inch inner wall of paper around each conductor and an outer wall 3/32 inch thick surrounding all three. The thickness of the lead sheath was one-eighth inch. In the 9,000-volt cable the thickness of the paper insulation was finally standardized at 6/32 inch and 4/32 inch, respectively.

The early experience in Chicago and elsewhere showed the necessity for avoiding sharp bends and for using extreme care in making the splices. A small number of burn-outs occurred during the first year's operation at 9,000 volts, and nearly all were due to sharp bends or to moisture at the joints. In order to determine how quickly moisture in a cable causes a breakdown, after it has entered through an opening in the sheath, in 1903 Mr. Burch of Minneapolis made some interesting experiments. He found that it usually requires from a day to a week for the moisture to work down sufficient to cause a burn-out. Paraffine had up to this time been used at the joints and in the terminal bells, but being hygroscopic in effect, due to voids left after cooling, it was not satisfactory at the higher voltage. About this time some of the engineers of the company, after considerable study and experimentation, developed a high-grade insulating compound, which since then has been used exclusively on all high-potential work.

The splices are made up with great care, and the compound is poured into the sleeve at a temperature of 150° C. in a manner to exclude all moisture. The success of this work is evidenced by the fact that there have been but two failures in splices during the last five and and-half years, and there are now some 3,400 splices in the high-tension system. The compound-filled terminal bells were formerly made of brass cylinders with a cast-brass base, a substantial ground connection being made at the base. On some recent work a few bells made of a special impregnated concrete have been used, with very satisfactory results. The proper protection of cables against damage due to burn-outs of adjacent cable has received considerable attention, and all cables in manholes are covered with split vitrified-clay tile cemented in. Entirely separate duct lines, either on different streets or on opposite sides of the same street, are provided so as to divide the energy along different routes when possible, so that all important sub-stations have at least two lines, each of which follows a different conduit route.

Semi-annual potential tests were made at the beginning, but were discontinued when the system became more extensive. The danger and liability of accident from these frequent high-potential tests were thought to more than offset the doubtful advantages derived. Since then testing has been limited to new, altered, or repaired cable, which, before being put into service, is subjected to a test of double working voltage for one minute.

The record of cable trouble for the last five and one-half years' operation, as indicated by the accompanying table, shows that failure of cables thus far has really not been a very serious matter. The line protective devices are now so perfected that a cable burn-out causes little disturbance. Of the total of 44 cases recorded in the table only four seriously disturbed the system, and each one of these was aggravated by faults in the protective relays. We believe that these faults have now been eliminated. The records of other companies have also been reported as good.

Summary of Cable Burn-outs
January, 1903, to July 1, 1908
9,000 Volts

Year.	Miles of Cable.	Breakdowns. In Joint.	In Bend.	In Cable.	External Cause.	Total.
1903	54	1	....	3	4	8
1904	71	....	....	2	1	3
1905	125	....	1	1	1	3
1906	209	1	....	2	2	5
1907	254	....	....	4	3	17
1908	264	....	1	3	4	8
Total	....	2	2	15	15	44

20,000 Volts

Year.	Miles of Cable.	In Joint.	In Bend.	In Cable.	External Cause.	Total.
1907	11	....	....	....	1	1
1908	11	1	....	2	....	3
Total	....	1	....	2	1	4

On the 20,000-volt line in Chicago, which has now been in service about 15 months, and which was an initial installation at this higher pressure, there have thus far been a total of four burn-outs, one of which was due to a mechanical injury, one to moisture in a poorly made joint, and two were in the cable itself.

It will be seen, therefore, that the experience with high-potential cable has not been such as to cause alarm. The most frequent sources of trouble are from without, and of these electrolysis is apparently the most persistent. However, with rapidly growing systems, the destructive effect and danger of breakdowns tends constantly to increase, and it becomes advisable to forego complacency for a while and to look into the system with inquisitive eyes to see just what is going on.

It was this desire to know more about possible dangerous potential rises, so that proper safeguards against them could be provided, if found necessary, that led the company to undertake a series of investigations, the principal results of which thus far obtained are described in this paper. A further purpose of the tests was to obtain information regarding these high-voltage systems for use in their further development. The investment required for such 20,000-volt and higher transmission cable systems is very large; it therefore becomes all the more imperative to know that such investment is a safe one commercially.

Tests of 9,000-volt System

About a year ago a series of oscillograph tests was started on the 9,000-volt system to determine whether or not resonance existed in any part of it, or if dangerous potential rises occurred from any other cause. The oscillograms obtained were taken at the Fisk Street station and included current and pressure waves for all principal switching operations, as well as several for a special cable connection in which resonance was sought. None of the records showed any appreciable excess voltage.

These investigations were later continued and expanded, but no dangerous rises were found. Spark-gaps were installed at four different points of the system and their record carefully kept. The gaps consisted of needle points, in series with which are resistance and fuse. They were connected between each phase and ground. These spark-gaps showed that there are frequent rises of about 70 per cent. and occasional ones of about 100 per cent. which apparently have no connection whatever with any switching. These occurred at the station and also in remote sub-stations. At times of cable breakdown, one or more of the spark-gaps invariably discharged at double potential. With grounded systems cables break down first between a phase conductor and ground. When the protective devices fail to act properly, as they did occasionally before recent improvements were made, the arc continues until it is communicated to one or both of the other phases. The effect on the system is then far more severe. Such occurrences were, however, the exception rather than the rule. When, during a breakdown, one or two of the spark-gaps discharge, it is on the phase or phases other than the one on which the burn-out occurs. Sometimes all three of the gaps discharge during cable trouble, but not simultaneously. It is quite probable that the potential rises evidenced by these discharges are due to magnetic effect in the generators as much as to surges in the cables. There was only one case of cable breakdown which seemed clearly the result of a surge.

The net result of this investigation indicates that at the present time the 9,000-volt system is reasonably free from dangerous conditions as far as destructive potential rises are concerned. It also indicates the advisability of continuing to make tests on newly installed or repaired cable at double potential for one minute.

Tests on 20,000-volt Line

Attention was then turned to the new 20,000-volt line in the attempt to learn what the difficulties are to be met with there. Spark-gaps were first installed in the Evanston sub-station at the end of the line and originally set at 1.1 inch, corresponding to 21,700 volts. During 15 days A phase discharged eight times, B phase five times and C phase six times. Five times during this period two gaps discharged at the same time. All other discharges were on one phase at a time. On only one day was there more than one discharge per phase, and on that day B and C phase gaps discharged together twice, the interval between the discharges being 18 minutes. With the exception of a single discharge on A phase, none of the discharges could be connected with any switching or other apparent source of disturbance. In this single case a heavy lightning storm passed over the overhead transmission line which is fed through transformers from the 20,000-volt line. It seems probable that a static charge passed from the line into the transformer and caused the rise which discharged on the A phase gap.

Fourteen days' experience with a gap of 1.15 inches (22,500 volts) showed seven discharges on A phase, six on B, and five on C. The only coincident disturbances were as follows: One discharge on A phase when a steam-driven generator at the Highwood station was synchronized; B and C phases discharged together when a steam-driven unit in parallel with generator or frequency changer in Evanston governed poorly, causing heavy cross-currents; one discharge on A phase when a steam-driven unit was disconnected at Highwood, and one discharge on B phase when steam-driven unit was shut down in Evanston. With the setting increased to 1.2 inches (23,300 volts) there were only five discharges recorded in four months, one on A phase, two on B phase alone, and one on B and C phases together. The simultaneous discharge on the latter occurred during a burn-out of the line, probably a breakdown of A phase to ground. One of the B-phase discharges took place when a connection between the 9,000-volt coils of the C phase transformer at Division Street burned out. A further increase in gap setting was made to 1.25 inches and left for six weeks, during which time A phase discharged when the line broke down. B phase also discharged, but the connection with a disturbance could not be learned. A final increase to 1.3 inches was made. This corresponds to 25,000 volts. During three months there was one discharge on A phase and two on C phase, but here again no cause for the potential rises could be ascertained.

Spark-gaps were also installed at the step-up end of the 20,000-volt line in the West Division Street sub-station during a test at that point. They were set at 1.1 inches, and during the few hours that they were connected each of the phases discharged heavily at different times. Recently spark-gaps were installed at the Calvary sub-station. They are set at 1.1 inches, and each phase has discharged heavily at times.

1. Abstract of a paper read before the American Institute of Electrical Engineers, New York, October 9, 1908. The authors are connected with the engineering department of the Commonwealth Edison Company, Chicago.

An attempt was made with the oscillograph to determine the relation between the potential rises and operating conditions. The oscillograph was connected at various times at the three switching points of the line, and some records were obtained for switching operations. Unfortunately, the time during which the line could be kept out of service for these investigations was so limited that only a few records could be obtained for each operation. It is recognized that in such a limited number (and especially where, as in most cases, only one phase pressure could be recorded) many disturbances may have escaped detection. However, many of the curves are of considerable interest. None of the oscillograms shows potential rises as high as those recorded by the spark-gaps. Had more oscillograms been taken, or had all phase pressures been recorded simultaneously, higher rises might possibly have been observed. However, the function of the spark-gap is clearly to detect high potentials, while that of the oscillograph is to show the character of the disturbance and its duration. The spark-gap watches the line continuously, while the oscillograph records occurrences for but very brief intervals.

There being but one oscillograph, and no pressure wires available the records at the different sub-stations were not taken simultaneously. The apparatus was set up at one place and curves were obtained for the various operations. The apparatus was then moved to the next sub-station and the operations were repeated.

The motor of the frequency-changer set at Evanston is wound for 9,000 volts, the line pressure being stepped down in three 200-kilowatt transformers. Curves were obtained when closing these transformers to a live bus-bar. In one case the transformers had previously been demagnetized by keeping them connected to the motor while being shut down until it had come to rest, the fields being kept excited. In another case they had been disconnected at full pressure. The difference in current rush emphasizes the advisability of keeping the transformers connected to a dying machine when shutting down. This applies also to transformers of synchronous-converter sets. The curves for starting the frequency-changer set from these transformers show no potential disturbance.

From the spark-gaps on the 20,000-volt line we learn that pressure rises in excess of 100 per cent. occur occasionally. The oscillograms thus far obtained give no clear evidence of the cause, but the cable broke down three times in 15 months—two of these times in the cable itself, either as a result of these rises or of weakness developed by mechanical stresses imposed upon the cable at the time of installation. This record is reasonably satisfactory, as during the first year's operation we must expect to eliminate the weakest points. The second 20,000-volt line, which will complete this northern ring, is being installed at the present time. After it is put in service the investigation will be repeated. The spark-gaps are kept in service continuously. If dangerous potential rises still exist the remedy will be applied, which, in the form of the aluminum arrester, is fortunately at hand. It is therefore quite prudent to state that 20,000 volts is a safe pressure for an underground system. Whether a higher voltage will be possible is a matter which has received and is receiving considerable attention.

Possible Future Developments

The awakened interest in, and growing demand for, a "City Beautiful" means the ultimate removal of smoky chimneys, dirt-producing factories, and in some cases of overhead lines from within the heart of the city. This will increase the demand for a means of economically transmitting energy underground in large quantities and in many cases for comparatively long distances. When that time comes, and the herald has already appeared above the horizon, the operating companies will ask of the manufacturer a cable successfully to withstand the higher pressures required for the service.

Another condition which brings about a demand for high-voltage transmission is the better efficiency at present obtainable from large generating units in large stations compared with small units in small stations. Recent improvements in turbine design are resulting in greatly decreased steam consumption, especially for smaller units. With a sufficiently high transmission voltage, however, it will in many cases be found cheaper to generate large quantities in a large station and transmit to the distant center where the load is comparatively small than to generate in a smaller station at that center.

Regarding the maximum cable voltage, Mr. E. J. Berg says: "With the present state of the art it would not be conservative to use a cable at more than, say, 25,000 volts between conductors, although it is to be expected that, at least with rubber-covered cables, or cables with insulation of varying specific inductive capacity, a much higher voltage can finally be used." Mr. H. G. Stott stated in 1906 in a paper on "Underground Cables," that in his opinion cable voltages of 44,000 could be used provided the neutral of the system were grounded, thus limiting the potential to ground to 25,000 volts. Cables have been made which in the factory have successfully withstood pressures as high as 80,000 volts or more for an hour, but they have not yet been made for commercial use at such pressures. The general subject of high-tension transmission by underground cable is ably discussed from the manufacturer's standpoint by Mr. Richard Apt, in the Elektrotechnische Zeitschrift of February, 1908 (page 159). Single-conductor, concentric, and three-core cables are discussed, as well as the relative merits of different insulating materials and of aluminum for single-conductor cables. Mr. Apt prophesies that the single-conductor cable for very high pressures is the cable of the future.

If we interpret the discussions of American cable engineers aright, they concur with Mr. Apt in his prophecy regarding single-conductor cable. The heating of the dielectric, due to electrostatic stress with consequent weakening of insulation, the critical voltage which no practical thickness of insulation will withstand—these and other conditions limit the stress to which insulation can safely be subjected. With single-conductor cable in a three-phase system the line pressure can thus be $\sqrt{3}$ times the maximum safe cable pressure. A thin wall of high dielectric strength is desirable to lessen heating and to keep the cable from being too large and too stiff, but then the corona effect, due to highly concentrated electrostatic stress, must be considered and guarded against. Asphaltum troughs certainly guard against electrolysis and also insulate the lead sheaths of adjacent cables from each other. These sheaths should, of course, be grounded at one end. It is possible that the commercial demand for underground cables at voltages from 30,000 to 40,000 will result in the use of single-conductor cable, possibly embedded in asphaltum.

With the increasing popularity of all-the-year country life, and with the spread of communities, as mentioned in the beginning of this paper, it is not hard to imagine a time when it may in exceptional cases be desirable to put some cross-country lines or parts thereof under cover. The general dependence on electrical energy and the immense investments at each end of these transmissions may in special cases justify a fairly large expenditure, provided a very reasonable assurance for reliability is obtained. As many of these lines will be operating at pressures beyond the reach of underground cables, it is possible that a recently suggested protected bus-bar construction may be used. Such a construction could follow the general surface of the land and be built on a right-of-way in conjunction with a railway. The art of insulator manufacture will undoubtedly advance, so that pressures of 200,000 volts or more could be employed if conditions should ever demand such pressures. This construction appears to obviate many of the shortcomings of present high-tension cable systems.

Summary

From the viewpoint of the investor or operator the state of the art regarding high-tension underground transmission might be summarized as follows:

1. Underground cable systems of 11,000 volts and under, if properly made, installed and operated, will give at least equally and probably more reliable service than most of the other elements in the electric power system of which the cable system is a part.

2. Where local and commercial conditions justify, pressures as high as 25,000 volts can be satisfactorily used even for systems aggregating as much as a hundred miles of cable. No single line of such a system would be much longer than 20 miles. If higher voltages are needed to meet operating requirements, and can be justified commercially, special construction will be necessary to overcome limitations in paper, rubber or varnished cambric insulation, and also in the standard forms of underground conduit or subways used in this country.

3. On comparatively short lengths, underground or under water, as a part of a long overhead transmission line, cables operating at 40,000 volts can be used.

4. Potential rises of 50 per cent. and 100 per cent. are not uncommon in large underground-cable systems, although this fact may not always be manifest, due to high factor of safety.

5. Definite knowledge of what actually occurs in large high-potential underground systems is still meager, especially regarding intensity and frequency of surges, heating effects, and critical temperature for various kinds and thickness of insulation, corona effects and similar matters.

In conclusion we would urge all companies having high-potential cable systems to keep a complete and systematic record of all troubles.

Discussion

In opening the discussion President Louis A. Ferguson (it was his first meeting as president) pointed out that, compared with overhead construction there seems to be much less known definitely regarding underground construction for high potentials, possibly because the necessity for it has not previously existed. The possibilities of the future are so great, however, and the trend of the times so marked, that it would seem that the subject is a very fertile one, and it is very important that the large operating companies which produce and sell electricity in bulk should make this matter the subject of further investigation and more serious thought, for a true knowledge of the operating conditions of their systems would necessarily reduce the first cost in investment and increase the reliability of their operation.

Mr. Charles H. Merz, chief engineer and manager of the supply company at Newcastle-on-Tyne, England, submitted a written discussion that was read by Professor Clifford. He compared the "draw-in" or "conduit" system that has been generally adopted for underground transmission in the United States with the so-called "solid" system of laying cables, largely in vogue in England, and with armored cables which are used almost exclusively on the Continent of Europe and also largely in England. He believed the extension of underground transmission to outlying and less congested districts would probably result in the merits of these other two systems of laying transmission cables being considered. According to Mr. Merz's experience the solid system in either earthenware or wooden troughs is the cheapest of the three systems mentioned. The question of the most economical arrangement of network is one that grows in importance as the area to be supplied increases. The use of high voltage enables the most economical section of copper to be used. This economical section is in general somewhere between 125,000 circular mils and 190,000 circular mils for three-core cables, that is to say, it is more economical in first cost per kilowatt transmitted to transmit a certain amount of power by means of a cable of this section working at a sufficiently high pressure to enable it to carry the required quantity of power than by any other section or voltage. In congested districts where it is impossible to avoid the use of several cables on the same route to a sub-station fed direct from the generating station, it would be more economical, if armored cable or cables laid on the solid system were used, to lay a relatively large number of cables of the economical section than a smaller number of cables of the larger section working at the same voltage. The balanced relay system has acted in such a satisfactory manner in actual practice that it is now being adopted largely both in England and abroad for protecting all kinds of cable systems, whether laid out as ring mains or on the radial system. Experience in the north of England shows that a 20,000-volt underground-cable system may be installed with assurance, and that it will work well. In the counties of Northumberland and Durham there is now nearly 100 miles of such cable in use. The cables are three-core paper cables, lead covered and laid on the solid system in earthenware troughs; they are made to stand a test pressure of double the working pressure after laying and jointing. In cables for extra high tension work the joints have generally been found to possess the lowest factor of safety. However, experience has proved that there is no more trouble with such a system than with a 5,000-volt system. On several occasions consecutive lengths of 20,000-volt cable connected all in series to form a single length of over 20 miles have been switched on, but in no case has there been any evidence at the spark-gaps or elsewhere of any excessive pressure.

Mr. H. W. Fisher, chief engineer of the Standard Underground Cable Company, believed that the method of joint construction is the first and most important consideration, and that after this work is done well, the use of any good insulating compound of proven merit with fairly high melting point and which does not, in compounding with the insulation of the cables themselves, form an inferior mixture, will insure perfect joints. It should be remembered that the insulating of the individual conductors is a matter which almost necessarily and unavoidably varies with the workman. By standardizing joint-making by the use of properly prepared paper tubes of suitable size and composition, he was enabled to insure at least the necessary minimum thickness of insulation at all points in a manner which in experience works out better than where the thickness or tension under which insulating tapes are applied by individual workmen are left to individual judgment. Mr. Fisher took exception to the statement that asphaltum troughs certainly guard against electrolysis, because the worst cases of electrolysis he had known were on cables laid in troughs filled with asphalt. He admitted that, if a cable could be perfectly protected from moisture by asphaltum, electrolysis would not occur, but this is scarcely possible, and at the moist spots the electrolysis is greatly accentuated causing pit holes in the lead.

Mr. H. G. Stott showed a number of lantern slides bearing on the results obtained on the large cable system in New York city for the Manhattan Elevated and the Subway. For the last three years there have been over 350 miles of 11,000-volt cables in service. Several years ago some trouble was experienced with bad joints and some due to surges. The number of burn-outs per 100 miles per annum has fallen the last two years to .28 per 100 miles of cable. That is a record which is rather assuring, and when our overhead transmission lines can show anything like that, we are in better shape for long-distance transmission. A feature which is going to help out materially in the development of power plants is the induction generator. We cannot, Mr. Stott believes, keep on adding indefinitely to the capacity in synchronous machines in one plant. With the induction generator, however, we can add on to our present plant indefinitely without increasing the short-circuit current, as the induction generator has the peculiar function of practically dying under short-circuits.

Mr. E. J. Berg of Schenectady thought it safe to draw the conclusion that difficulties due to abnormal voltages will increase with the voltages, as should be expected, as the energy involved is in proportion to the square of the voltage. However, the 20,000-volt system is practicable beyond any question. The only question is how much higher we can go. He then discussed the large currents obtained on connecting in transformers. The reason for the big current is primarily that the saturation of the transformer is quite high. If we limit the flow of current to a certain value, as full-load current, we would probably have to limit the density to 70,000 lines per square inch, which would make a more expensive transformer, but which would probably be a warrant for changing the design.

Mr. Wallace S. Clark, engineer for the General Electric Company, declared that periodic testing to watch the system for electrolysis is highly important as it would save many burn-outs. As far as the use of 25,000 volts is concerned, from the cable manufacturers' viewpoint there is no hesitation in it, everybody can use it, but there are quite a number of considerations which must not be overlooked. First, it will not be practicable with any of the forms of insulation in use at the present to make very small conductors at 25,000 volts satisfactorily; second, the 25,000-volt cables and 20,000-volt cables, which are in use in this country, are really working at a less factor of safety than the bulk of the 11,000-volt cables.

Mr. Alex Dow of Detroit narrated at length the experience with two cables in Detroit operating regularly at 23,000 volts. Each cable is 7.5 miles long. The breakdowns on one cable were very numerous in the joints, which were taped according to the manufacturer's directions. It was practically impossible to keep this cable in service, so all the 125 joints were remade. Whereas in the original joint there had been no restoration of the rubber insulation, in the new joints the rubber insulation was restored, according to the usual manner, and the varnished cambric insulation was restored, thoroughly painting it over also with a non-drying varnish of the same character as used in making up the cable. The result was very satisfactory. The joints, placed on test in comparison with the original joints, showed that they were infinitely better, remaining intact under tests of 30,000 volts for an unknown period. Mr. Dow concluded his discussion by considering the recommendations of Mr. Merz in favor of the solid system as being eminently suitable to English conditions, but not suitable to conditions in this country. Climate, nature of the soil, cost of labor, character of the distribution system, etc., are very different here, and the solid or armored cable systems do not have the advantages over the conduit system here that they may possess in England.

Mr. Warren Partridge related the experience of the Public Service Corporation of New Jersey with high potential underground transmission. When reduced to burn-outs per mile of cable per year, this has been considerably better than the 20,000-volt experience in Chicago, but when compared with the Chicago 9,000-volt system, the results have been very much worse. The equipment of the Public Service system is as follows: Marion plant with 10,000 kilowatts in 25-cycle turbine units and 6,000 kilowatts in 60-cycle turbine units; Coal Street plant with 9,000 kilowatts in 60-cycle engine units; City Dock plant with 5,950 kilowatts in 60-cycle engine units and 3,000 kilowatts in 60-cycle turbine units. The City Dock plant supplies 2,400-volt two-phase current to the transmission system through 3,000-kilowatt transformers connected on the two-to-three-phase Scott system. With this exception all generators are three-phase, 13,200-volt, Y-wound, with ungrounded neutral. Connected to the 13,200-volt buses at these plants are 21 underground feeders, aggregating 81 miles of cable and two overhead feeders aggregating 65 miles of line. These lines feed nine 60-cycle sub-stations in which the greater part of the apparatus consists of step-down transformers, and 12 25-cycle sub-stations in which are synchronous converters. The 60 and 25-cycle systems are independent except that some cables can be used on either service. All cables are three-conductor, paper-insulated. The conduits are part fiber duct and part tile duct. The record of cable troubles from January 1, 1905, to October 1, 1908, is as follows: Breakdowns, in joints, 11, from external causes 16, and in the cables 24; a total of 51. The total number of cable-mile years is 255, so that the cable breakdowns not accounted for number approximately .09 per mile of cable per year. The results in Chicago on the 9,000-volt system are approximately .02 and on the 20,000-volt system .14 breakdowns per mile of cable per year. Twelve of the 21 cables have had no trouble, two cables have had one each, and three two each, and the remaining 16 breaks occurred on four cables. Two of these four cables are tie lines for 25 and 60-cycle service, respectively. They run partly in conduits, as armored submarines and as overhead lines, and have, therefore, peculiar physical characteristics. A considerable amount of synchronizing is done over them. Some of the breakdowns on these lines have certainly been due to failure to synchronize, and it is believed that others have been due to this same cause even when it was impossible to trace the sequence of events. The other two lines that have a large number of burn-outs are both long lines, seven miles each, and both operated exclusively on 60-cycle service.

Voltage surges of more or less severity have taken place a number of times on the system, as evidenced not only by the cable punctures but by the wrecking of many sets of static dischargers and lightning arresters. Records for three years show that cable breakdowns caused seven per cent. of all the interruptions to service. The fact that the Public Service voltage is higher than the other systems seems the most obvious explanation of the results, the answer being that as the voltage has been raised, the general factor of safety of cables, switching devices, protective apparatus, and the personal element of the operators, has lagged somewhat behind.

Mr. E. E. F. Creighton pointed out that there is a tendency to danger from another source which may be distinguished from that of mere increase of kilowatt capacity and mileage of cable. This is involved in accidental coincidence of capacity, and inductance, with a surge frequency or harmonic when an accidental arcing ground takes place. He is convinced that these three conditions outlined are quite distinct, although they may all exist simultaneously.

First. The troubles resulting from excessive power. A short-circuit of great power stores up electromagnetism which, if suddenly destroyed, produces excessive potentials.

Second. That a mere increase in power and cable mileage may have less to do with the production of transient abnormal potentials was proven by some oscillograph tests made by the speaker in association with Mr. S. D. Sprong.

Third. The surges which are not directly connected with switching or accidental conditions and which frequently produce higher potentials on the system than accidental arcing grounds.

In some tests made several years ago with Mr. Cato on the system of the Detroit Edison Company operating under normal conditions the speaker found potentials of 125 per cent. every few seconds, potentials of 150 per cent. to 175 per cent. every few minutes, and potentials of over 200 per cent. twice in one day.

Mr. Henry Floy of New York city showed a chart on which were plotted the prices of cables that he had lately secured on cables from 11,000 up to 75,000 volts. These led him to believe there should be no 25,000-volt limit, as advocated by some. In fact, he saw no reason why we cannot go to 35,000 or 40,000 volts, because the types of cable are identical.

Mr. John W. Lieb, Jr., spoke of his experience with underground construction abroad, particularly in Milan, Italy, with Edison tubes and iron-banded armored lead-covered cable. The type of cable advocated by Mr. Merz is very much better suited to European conditions than our drawing-in system, since they have to deal with built-up communities where suburban districts do not exist, as is our own case, and where they can more easily and readily foresee the requirements. He then read a communication that was prepared by Mr. Philip Torchio, of the New York Edison Company, descriptive of that company's experience.

Mr. Torchio presented a record of disturbances in the high-tension cables of the system during the past few months. He gave a table which indicates that since June 10 there were 12 disturbances on the system. Of these 12 disturbances, at least four were indicated by the selective ground indicator located on the feeder where the lowering of resistance was going on before the ground indicator gave any indication. From the theoretical point of view the above records are interesting in showing the existence of the time element in the breakdown of insulation, the effects of momentary grounds on systems, etc. Attention is called to the fact that in five out of 12 of the cases reported the selective ground indicator gave its indications long enough in advance to enable the operator to clear the defect before actual short-circuit occurred. The practice of the New York Edison Company in subjecting cables to high potential tests differs somewhat from that given in the paper, in that new, altered or repaired cable is subjected to a test of double working voltage between conductors and ground for two minutes, and 20 per cent. above working voltage between conductors for three minutes.

Dr. Chas. P. Steinmetz said that the destructive possibilities on the cable are very largely dependent in almost direct proportion to the power back of the system. It would be interesting to calculate how much stored energy there is available in the system, not merely the rated capacity of the engines and generators, but the energy stored in the magnetic field of the conductor, in the electrostatic field, in the synchronous apparatus, generators as well as synchronous motors and synchronous converters, which are all rated at a moment's notice, or without a moment's notice, to feed back the energy into any part of the system, and furthermore to calculate the maximum discharge rate, to the stored energy, because I believe you would find then that this enormous power of 118,000 kilowatts does not represent the full volume of power, and that the discharge rate runs many times higher, probably into the millions of kilowatts, and the capability of producing power momentarily at the place where things go wrong. That must be taken in view, in discussing the action and operation of a cable system. This whole study of transient phenomena in distribution systems, transmission systems and underground cable systems, is a most fascinating subject of study to the electrical engineer, and to the operating engineer it should be more than fascinating, because the success of his operation very largely depends on his ability to keep these transient phenomena away from the system. Dr. Steinmetz pointed out how the investigations should be extended, what precautions are to be observed and what special apparatus should be employed. Speaking of the oscillograph, he said it is really beginning to take the place in electric circuits of the indicator in steam-engine practice. Special care must be observed in interpreting its curves, however. Wave shapes must be studied in detail.

Mr. L. T. Robinson spoke briefly on how the sensibility of the oscillograph may be increased.

In closing the discussion, Mr. E. O. Schweitzer, one of the authors of the paper, explained that the meaning of 100 per cent. above normal pressure has reference to 100 per cent. above normal pressure of any phase to ground. His collaborator, Mr. Peter Junkersfeld, followed him, answering several of the questions that had been brought up during the discussion. He fully agreed with Mr. Stott about the increasing danger when the capacity is so great. In the Chicago system the total rated capacity of the three stations connected is 146,000 kilowatts. "We operate the stations in two systems," said the author; "otherwise the possible amount of power that can be delivered instantaneously is something we feel more comfortable about when we do not figure on it."

A HIGH-RESISTANCE ALLOY

A resistance alloy recently produced and given the name of Nichrome, has, it is said, 60 times the resistance of copper, or more than three times that of German silver. A high-resistance wire has long been sought, and its discovery and practical manufacture have opened up new possibilities in the field of heating and cooking by electricity, for Nichrome can be made either in wire, ribbons or sheets.

The trouble has been to obtain a resistance wire that would stand an intense heat without becoming brittle, or oxidizing. German silver contains zinc, and when heated shows objectionable characteristics. On the other hand, Nichrome permits of the concentration of heat. German silver cannot safely be worked above 500° F. without becoming brittle, while nichrome is worked above red heat up to 1,500° F., without danger of disintegration, brittleness or scaling, the manufacturers announce.

Unlike the high-resistance nickel-steel alloys, nichrome is non-corrosive. The new alloy is thus especially valuable in arc-lamp resistances, commercial resistance units, rheostats and controlling apparatus.

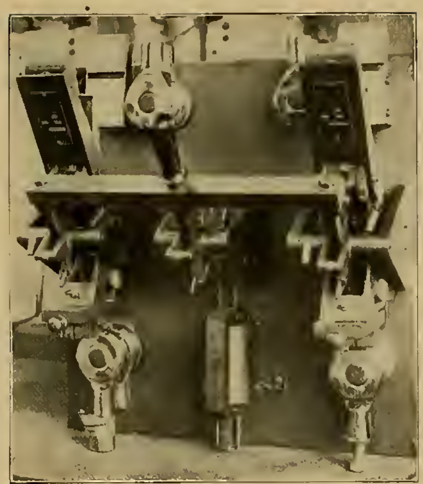
Nichrome is the product of the Driver-Harris Company, whose factory is at Harrison, N. J. The alloy may be produced in any desired form or size of wire.

As announced in the Western Electrician several months ago, the Commonwealth Edison Company of Chicago has leased the corner, 40 by 80 feet, on the ground floor of the Railway Exchange Building, at Michigan Avenue and Jackson Boulevard, now occupied by seven stores, together with 30 by 50 feet in the basement, and will divide the space into a kitchen, pantry and dining room, and equip it for exhibition with the latest electrical household appliances at a cost estimated at $75,000.

SPECIAL APPLICATIONS OF STANDARD CIRCUIT-BREAKERS

In the development of new applications of machinery of various kinds conditions often arise which call for special apparatus or certain applications of old apparatus. Standard apparatus, if properly designed, can be readily adapted with very small changes, to suit these special conditions, and the better the design the more special applications it will be suitable for. A notable example of this is shown in a recent application of circuit-breakers. In this case a large mining company desired a circuit-breaker which would open the circuit of a motor on overload, which could also be opened from a distance by the operator at the machine and which could absolutely be held open by him, regardless of the man in charge of the motor. Inasmuch as an absolute interlocking of the machinery was necessary, no chances could be taken of the motor being started when men were working about it or the driven machine.

The accompanying illustration shows this breaker, which is an adaptation of the standard design of type "CC" circuit-breaker, manufactured by the Westinghouse Electric and Manufacturing Company. This breaker consists of two single-pole breakers and a dummy pole, all closed by the same handle. Each of the single-pole breakers is equipped with an overload coil, and the operation of either overload coil opens the breaker, as in the standard design. In addition, the breakers can be instantly opened by throwing the handle up, it being not necessary to hunt around for a small knob for the purpose of opening the breaker. This feature is of great advantage where the breakers may be left to unthinking operators, such as are not infrequently found around industrial plants.



SPECIAL APPLICATION OF A STANDARD CIRCUIT-BREAKER

In addition to the two overload coils, there is placed on the dummy pole a shunt tripping coil that can be left in circuit continuously. Upon closing the circuit through this shunt coil, the middle pole is tripped out, and this in turn trips out both of the active poles, thus opening the breaker. The handle is also locked down by an auxiliary latch in such a way that it cannot be closed down until current is taken off the shunt tripping coil, allowing the core to drop. It is thus impossible for anyone to close the circuit-breaker so long as this coil is energized.

In the particular application, small knife switches were placed at various points, each switch closing the circuit through the shunt tripping coil. Whenever it is desired to stop the machine and hold it in a stationary position, one of these small switches is thrown in, which immediately opens the breaker and locks it in this position until the switch is opened. The breaker is controlled entirely from alternating-current circuits, no direct current being necessary, and it operates large three-phase motors, opening two legs of the three-phase circuits. The breaker is adapted for mounting directly on the wall, the connections being on the face of the panel. The Westinghouse company has developed many other attachments and special applications of this breaker, which adapt it to various special requirements.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, October 1.—Steps are already being taken to establish a temporary telephone exchange for the central districts of Paris after the recent fire, so that subscribers will suffer as little as possible. It will be probably three months, however, before the circuits for the 18,000 subscribers will be established again. The walls of the telephone exchange remain standing, but the five-story building is a total wreck as far as the inside is concerned, and will have to be demolished. Upon closer examination it was found that very little of the switchboard installation can be used again. The first proposition to erect the temporary exchange in the court of the Louvre, known as Place du Carrousel, was abandoned, as it seems to be thought that this would increase the fire risk of the great art collections of the Louvre buildings. Accordingly it was decided to erect a large one-story shed in the space which separates the burned exchange from the Central Postoffice, this space having been a street and known as the Rue de Gutenberg. A number of multiple boards which were in construction are to be set up here, and perhaps some switchboards can be secured from foreign countries. It is the general opinion that the fire was caused by a short-circuit among the cables of the basement.

A project is on foot in France for utilizing a large amount of waterpower in the Pyrenees region, which will be used for operating existing or projected electric railroads. According to the present plans there will be two hydro-electric plants of large size. The first of these is to be installed in the valley of the Eget, in the Upper Pyrenees. The water of the basin of the Oule will be collected by a dam, and a four-mile canal will bring the water to the hydraulic plant. In this way it is expected to secure a high pressure fall of over 2,000 feet. For the first plant alone the estimated expense of erecting is $2,000,000. The funds will come conjointly from the French government and the Southern Electric Company.

Among the recent electric developments in Austria-Hungary I note the suburban electric road which is being erected at Tatrafured, which will run from this locality through the surrounding region. The cars are to be electrically heated. An electrically operated cable road is now in construction in the same district, and it will be opened up this winter. In the town of Gorz a concession is obtained by a local company for constructing three sections of electric tramway.

In Italy the Cismon-Brenta Company of Milan has obtained the rights for a water supply coming from the torrent of the Cismon at the locality of Lamone. The plant which it is proposed to erect at this point will have a capacity of 6,000 horsepower and will use a 170-foot head of water. A power line at high voltage will be run from the station in the provinces of Belluna, Padua and Vicenza for public and private lighting.

An important electrical enterprise in Italy will be the construction of the double-track electric railroad from Genoa to Milan. It is under the control of the state. The work will soon be commenced upon the route, which has been already laid out.

In France, among the most recent electrical affairs is the tramway system from St. Etienne to Annonay. The plans for the road are about finished, and a method of traction will be used which is adapted for mounting the heavy gradients of the line. A. DE C.

GREAT BRITAIN

London, October 3.—The annual report of the postmaster-general does not contain any very startling statements. A remark of interest is that the new power station which is being built on the River Thames, close to the city, is nearing completion, and, as a matter of fact, orders have since been placed for steam turbines, alternators, surface condensers, etc. It is also interesting to note, in regard to the many complaints as to the inefficiency of the system of metering telephone calls on the message-rate system, that a committee of the London Chamber of Commerce has made a thorough investigation on behalf of subscribers, and is satisfied that the percentage of error is in favor of subscribers and not of the Postoffice.

A good deal of feeling is shown at the action of certain cable makers here in quoting, in some cases, cable at prices varying but a few pence, the object being practically to determine, if cable of a certain grade is required, which firm shall secure the order. The result has been that orders go abroad, municipalities preferring to have something even of a little inferior quality, rather than submit to the tactics of what is becoming known as the "ring." In this way an order for cable was given to a German firm last week, and the same thing has happened in other instances.

The Board of Trade has notified the Local Government Board that it will not in future sanction the erection of standards for tramway purposes in the center of roadways, and the Local Government Board will not, I understand, sanction loans for electric lighting where the posts are to be placed in the center of the streets. Center posts of any kind have little to commend them, while the danger to traffic is obvious.

All round the country there is a noticeable decline in tramway receipts, which is generally attributed to trade depression. Liverpool and Glasgow are both suffering, while the effect is even more noticeable in Lancashire as a result of the cotton strike which is now in progress.

A limited-liability company is being formed to exploit the electrical signaling system recently described in the Western Electrician by which the driver of a train is notified on the locomotive of the condition of the signal, thus avoiding the possibility of collisions in foggy weather. The system in question is in use experimentally upon the Great Western Railway. G.

NEW ENGLAND

Boston, October 10.—The success of the Boston and Suburban Electric Company in showing better earnings with prospective dividends since its rate of fare was advanced to six cents, and the fact that the State Railroad Commission is inclined to favor such a course in the interest of stockholders when well-managed roads fail to operate profitably, has led other trolley lines in the state to consider taking similar action, and it is said that the Northampton and the Connecticut Valley roads will petition for authority to advance their rates.

The Van Bergh Electric Protection System Company has decided to locate in Plainville, a suburb of the manufacturing district embracing the Attleboros, in Massachusetts, and a factory for 300 hands will be built, it is said, on land donated by local interests.

The Atlantic Shore Line Railway, operating north of Hampton and Rye beaches in New England, along the coast, has just filed its annual report with the Maine Railroad Commission. Gross earnings were $348,207, against $295,152 in the preceding year, but operating expenses rose to $229,431, against $160,972, so that net earnings were lighter in proportion, being given as $119,376, against $137,304 a year ago. The surplus is now $51,758. During the year $10,842 more has been expended upon improvements than was laid out during the previous year.

The Bangor Railway and Electric Company of Bangor, Me., has floated this week in Boston a bond issue of $700,000, first consolidated mortgage, bearing interest at five per cent. B.

NEW YORK

New York City, October 10.—If a satisfactory agreement with the Interborough Rapid Transit Company can be made, as the members of the Public Service Commission believe, the Steinway or Belmont tunnel from the foot of East Forty-second Street to Long Island City, which has been finished but unused for a year, will be purchased by the city and the present owners will be allowed to operate it on shares with the city. It is probable that the city will pay about $6,500,000 for the property on which the Belmont interests spent between $7,000,000 and $8,000,000. The Public Service Commission's chief engineer, Henry B. Seaman, is engaged in an investigation which will result in a report to the commission upon the physical condition, probable traffic and possible connections, and the Bureau of Statistics and Accounts is engaged in ascertaining by examination of the books and accounts of the Interborough Rapid Transit Company and the New York and Long Island Railroad Company the actual cost of the construction.

The Pennsylvania Railroad Company is conducting a series of very interesting experiments in electric transmission on Hempstead Plains for the purpose of ascertaining the most effective service to install on its electrical roads in Queens Borough and through the tunnels. The stretch of experimental line is about six miles in length. One part is a section of tunnel roof about 600 feet long, representing the tunnels under the East River. Several methods of suspending overhead wires by means of cross-bridges, brackets, poles and tunnel suspensions are being given a trial. The work is being conducted under the supervision of George Gibbs, the engineer in charge of the electric system of the New York terminal.

Contracts were signed last week for the new sub-station which the Brooklyn Rapid Transit lines are to erect at Thirty-eighth Street and Fifth Avenue, Brooklyn. The new structure is to be a rush job, as it is to be ready for use within five months, and both night and day construction gangs will be employed. The new station will consist of a single high story, with mezzanine gallery, its outer dimensions 60 by 100 feet, and fireproof in every detail. With its equipment of battery, transformers and switchboards it will cost $200,000. It will supplant the antiquated small sub-station on the Thirty-ninth Street pier.

The Public Service Commission has addressed two complaint orders to the receivers of the Yonkers Railroad Company, the Union Railway Company and the Westchester Electric Company, requiring them to answer within five days complaints that they have cut off transfers between connecting lines of railroads in the Bronx and are exacting extra fares for through transportation from Yonkers and Mount Vernon to New York.

Three large iron covers of manholes over the New York Edison Company's conduits were blown over 200 feet in the air at One-hundred-and-twelfth Street and Broadway, where leaking gas in the conduits and a short-circuit caused the explosions. At the northeast corner of One-hundred-and-twelfth Street the asphalt was blown out, making a hole 10 feet in diameter. People living in the neighborhood were panic-stricken by the explosions and the trembling of the buildings. Some thought it was an earthquake. No one was injured. W.

SOUTHEASTERN STATES

Charlotte, N. C., October 10.—About 3,000 horsepower of the hydro-electric power developed by the Rockingham Power Company at Blewitt's Falls on the Pee Dee River in North Carolina, will be utilized by cotton mills in Rockingham, N. C. The foundations of the power house on Pee Dee River are being laid, and power will be available by July, 1909. The falls represent a total of 30,000 horsepower.

W. S. Lee and L. C. Harrison of the Southern Power Company, who are interested in the construction of an extensive interurban electric system, have secured additional franchises to build lines through the towns of Lowell and Mt. Holly, cotton-manufacturing centers. Several franchises in other towns within a radius of 30 to 40 miles of Charlotte, N. C., have also been secured. The interurban concern was chartered under the laws of New Jersey as the Charlotte Power Company, and a franchise will be asked to operate the lines into Charlotte.

The Horseford Power Company, Hickory, N. C., whose name has been changed to the Western Carolina Power Company, increasing its capital stock from $125,000 to $300,000, will begin the construction on a hydro-electric plant on the Catawba River, near Hickory. The new company proposes to distribute power over the district, including the towns of Lenoir, Morganton and Hickory.

The East Durham cotton mills, Durham, N. C., are putting in electrical equipment to operate the machinery of the mills. The cost of the change from steam to electricity will be about $75,000.

The Crescent Manufacturing Company, a textile plant at Spartanburg, S. C., will be operated by electric power instead of steam as soon as the change can be perfected.

The Atlantic Coast Line Railway has installed a large electric plant for lighting its shops at Waycross, Ga. D. H. L.

OHIO

Toledo, October 10.—Much local interest is centered here on the big telephone merger which was this week worked out in detail whereby the Citizens' Telephone Company of Columbus, the Cuyahoga Telephone Company of Cleveland and the United States Telephone Company combined their interests. James S. Brailey, Jr., of Toledo, was in attendance at the meeting this week, and all details were satisfactorily worked out. The Cuyahoga company is the local Independent concern at Cleveland and has 26,000 subscribers; the Citizens' company has about 15,000, while the United States is the long-distance concern of Northwestern Ohio and controls the Lancaster Telephone Company and the Independent plants at Zanesville, Massillon, Findlay, Youngstown, Fostoria and the Stark County Telephone Company. The holding company will operate under a lease said to be practically perpetual. Its authorized capital will be $10,000,000, of which $5,500,000 will soon be issued.

It is rumored that the promoters of the Dayton, Springfield and Southern Railway are projecting an electric railway from Xenia, O., to Wilmington and later to Cincinnati, and that the company may purchase the Springfield and Xenia and the Dayton and Xenia lines in furtherance of this plan.

The new municipal lighting plant at Lima is now being held up because the council refuses to confirm the employment of C. F. H. Ahlm of Cleveland at a compensation of $2,400 as engineer to construct the plant. The employment was provided for in August, since which time two councilmen have changed their minds and the work is at a standstill. S.

INDIANA

Indianapolis, October 10.—The Indianapolis and Cincinnati Traction line, operating between Indianapolis and Shelbyville, was put out of business one night during the last week for several hours on account of a peculiar obstruction. After continued search for the cause the chief lineman found that an owl had fallen on a wire which ran into the sub-station at Prescott. It caught by one of its wings, while its feet touching another metal piece connecting with the building caused the short-circuit.

The Indiana and Michigan Electric Company has closed the gates of its large dam in the St. Joseph River, north of South Bend. The reservoir is 2,600 feet wide and 10½ miles long, with an average depth of 20 feet. This structure is regarded as one of the most valuable and perfect sources of waterpower in the Middle West. The construction of the dam cost more than $1,000,000. The power will be transmitted to South Bend, Mishawaka, Elkhart and St. Joseph, Mich. The power will be used by the Murdock traction line between Goshen and Michigan City and by the Southern Michigan line between South Bend and St. Joseph.

The Rush syndicate, which proposes to erect a power dam in White River, near Decker, reports that preparations for the erection of the dam are all completed, and the company is waiting for the consent of Congress for such improvement. The velocity of the stream has been ascertained at various stages since January and the result is gratifying to the promoters.

The Danville (Ind.) Light, Heat and Power Company has purchased a new site on which to erect a new building of steel and cement 50 by 114 feet. The new plant will be equipped with modern machinery and the plant sufficiently enlarged to furnish light and power not only to Danville but to Plainfield, Brownsburg and the farmers throughout the community.

The Home Telephone Company of Mishawaka has just completed extensive improvements. This company has made remarkable progress. Five years ago the Bell company, then alone in the field, had 200 telephones in operation. The Home company secured a franchise and prepared to install 400 telephones. In less than two years the switchboard of the plant was run to its full capacity, and the improvements just completed make provision for more than 1,000 telephones, 978 of which have already been installed. A recently issued directory of the Bell company shows 142 telephones in operation by that company. Mishawaka has more underground telephone circuits than any other city of its size in the country, it is said, and the plant is credited with being one of the most complete in the country, having direct toll connection with 88 exchanges in Indiana and Michigan. S. S.

ILLINOIS

Peoria, October 10.—The Nauvoo Electric Light and Power Company of Nauvoo has been incorporated with a capital of $5,000 to furnish light and power. The incorporators are John A. Bortz, James H. Farron and John Schmitz.

The Trio Manufacturing Company of Rock Island has been incorporated with a capital of $40,000 to manufacture and deal in electrical machinery and appliances. The incorporators are J. T. Marron, C. A. Walker, W. H. Dickman.

A meeting of the lighting committee of the City Council of East St. Louis will be held to consider the application of the Consumers' Light and Power Company for a franchise to install an electric-light system in East St. Louis.

The old project of an electric interurban between this city and the city of Rock Island has been revived. The Illinois Traction Company considered this three years ago and abandoned the plan and confined its operations to the east and south of here. Now a company of eastern capitalists has taken up the matter and has commenced the work of surveying the route, starting at the Rock Island end. It is proposed to follow the line of the Rock Island and Peoria Railway, with the exception of leaving the route at Cambridge and going to Kewanee and then back to the railway again. S. F. Moore of Cleveland, Ohio, representing the eastern capitalists, was in the city this week conferring with the Peoria Merchants' Association in relation to the project. V. N.

NORTHWESTERN STATES

Minneapolis, October 10.—C. C. Wolf of Parkersburgh, Iowa, has pledged $60,000 to the Des Moines, Winterset and Creston electric-line project. It is said eastern capitalists are willing to furnish three-fourths of the $2,000,000 required to build the road.

An interurban line from Ida Grove to Correctionville, Iowa, is proposed.

The City Council of Waverly, Iowa, will call a special election at which a vote will be taken to issue bonds to replace the electric-light and waterworks plant which was burned recently.

The construction of the line of the Muscatine-Iowa City interurban railway will be commenced early in 1909. The Independent Power Company of Muscatine, Iowa, has arranged for the sale of $2,000,000 worth of bonds with which to construct the Moscow canal project, which will furnish power for the interurban.

The Village Council of Aurora, Minn., has been petitioned to defer granting a franchise to Clarence B. Moore of Virginia, Minn., for an electric-light and gas plant. It is proposed to have the village own the plant.

The Electric-Automatic Voting Machine Company of Minneapolis, Minn., has been organized to manufacture an electric voting machine invented by William J. Bohan of the engineering staff of the Northern Pacific Railway.

Pay-as-you-enter cars have been put into service by the Twin City Rapid Transit Company between Minneapolis and St. Paul.

The switchboard room of the Livingston Water Power Company, at Livingston, Mont., was recently damaged by fire to the amount of about $3,000.

B. A. Tenney of Casselton, N. D., advises that a new electric-light plant be installed at a cost of from $10,000 to $15,000.

Concrete work has been started on the power plant of the Wausau Street Railway Company, at Wausau, Wis.

J. G. Robertson of St. Paul, Minn., will install the new electric-lighting plant at Cumberland, Wis.

The Marshfield (Wis.) Water, Electric Light and Power Company has finished the excavations and embankments for the artificial lake which will serve as a reserve water supply.

The Wisconsin Electric Railway Company has nearly completed the ballasting work on the interurban line between Neenah and Oshkosh, Wis.

The Electric Light and Water Commission of New London, Wis., will build an addition to its engine room and install more machinery. R.

WESTERN CANADA

Winnipeg, October 10.—The Manitoba Telephone Commission has 433 men employed in building long-distance telephone lines, in addition to 45 foremen. Municipal rural lines are under construction in Wallace, Woodworth, MacDonald, Miniota, Hamiota, Argyle, Strathcona, Brandon and other places. Exchanges are being installed at Minnedosa, Brandon, Elkhorn, Virden, Gilbert Plains, Dauphin, Dugald and Miami. Long-distance lines are under construction between Baldur and Miami, Minnedosa and Binscarth, St. Agathe to St. Malo, and from Snowflake to the United States boundary, where connection will be made with several long-distance lines.

At a meeting of the City Council at Edmonton, Alberta, it was decided to sell the municipal telephone line running to St. Albert to the Alberta government.

The Town Council at Pincher Creek, Alberta, has signed a contract with the Pincher Creek Electric Light Company to install an electric-light and power plant.

Mr. Wynn Meredith, an American consulting hydraulic engineer, has prepared a report on the suitability of the Jordan River, Vancouver Island, as an additional source of supply for electric power for the British Columbia Electric Street Railroad Company. The company has made an appropriation of $1,500,000 to establish an additional power plant on the Jordan River as soon as a suitable location can be found, as more power is necessary in Victoria, B. C. R.

PACIFIC SLOPE

San Francisco, October 9, 1908.—On Monday the Stanislaus Electric Power Company, for the first time, turned over the machinery in its new power house on the Stanislaus River in Tuolumne County, Cal. So far only one unit, with a capacity of 6,700 kilowatts, is being operated, but the full equipment of the present plant, of about 20,000 kilowatts capacity, will be started in 30 days or less. As soon as possible, the capacity of the plant will be increased, until it is double that of the equipment now being completed. Power is now being supplied within a comparatively small radius in the vicinity of the plant, but by the end of the month the entire distributing system of the company, as far as it has been completed, will be in use. The long-distance transmission line is now completed across the San Joaquin Valley and as far as Mission San Jose in Alameda County. It will be continued around the west side of the bay to San Francisco, within the next two or three months. The line voltage is 100,000.

The lines of the Great Western Power Company, now nearly completed, will also carry 100,000 volts, but the plant of the latter company is not yet in operation.

F. H. Poss, San Francisco representative of the Benjamin Electric Manufacturing Company and the Holophane Company, has moved from 656 Howard Street to permanent quarters at 153 New Montgomery Street.

Representatives of a number of California power companies met on Tuesday of this week at Los Angeles to consider problems of power plants in the national forests, and the question of obtaining perpetual or long-time rights-of-way for their lines through the reserves. A similar conference is to be held in San Francisco later on.

Surveys are now under way in the neighborhood of Bellingham, Wash., for power plants which will develop 75,000 to 100,000 horsepower, or more than all the other power plants in the Cascades combined, and which will furnish electricity for all purposes in the Puget Sound country. The preliminary work is in charge of C. L. Milton, a Colorado civil engineer, and the project is backed by Colorado capital and an English syndicate. Surveys are now being run for a three-mile tunnel which will give a 350-foot fall. The first step toward power installation will be the building of a small power plant at the junction of Bacon Creek with the Skagit River, which will be used to supply power for construction of the other plants further up the stream. It is stated that between $6,000,000 and $7,000,000 will be expended in the projects. Transmission lines are to be extended to all Puget Sound points.

The power plant of the Great Northern Railroad near Leavenworth, Wash., which will supply power to operate trains through the tunnel in the Cascade Mountains near Stevens Peak, is now being completed. This equipment will develop 12,000 horsepower, but plans have been made for a second installation of equal capacity between the present one and Leavenworth. The Great Northern will be the first transcontinental road to use electricity to so large an extent in the transportation of trains.

In a suit brought against the city of Alameda, Cal., by M. Davoust, whose wife was killed 10 years ago by contact with a wire of the municipal lighting plant, $9,000 damages was awarded. The trial took took place last week.

The Edmonds Elecric Light and Power Company has been incorporated at Edmonds, Wash., with a capital stock of $20,000, by C. Malmo, W. R. Ammon and A. G. Pike. A plant will be built at a cost of $10,000, to be operated by a 200-horsepower steam engine. Work will be begun at once. A.

PERSONAL

Prof. Henry S. Carhart of the University of Michigan is in London as a delegate from the United States to the International Congress on Units and Standards.

Mr. W. J. Stanton, a telephone writer and engineer, has severed his connection with the Dean Electric Company of Elyria, Ohio, to take a position with the Homer Roberts Telephone Company of Chicago.

Mr. Ira E. Price, for 14 years chief electrician of the People's Electric Light and Power Company of Canton, Ill., has resigned his position to go to Newhart, Ark., with the People's Light, Water and Power Company.

Chief Engineer R. McCalman of the Illinois Traction System has tendered his resignation to President McKinley, to take effect in the near future. Mr. McCalman has held his present position for three years and during that time has been in charge of all construction and maintenance work for the traction system. He leaves to become chief engineer of the Standard Contracting Company, at Cleveland, Ohio, and will take charge of several large contracts for dredging and dock work which that company has with the federal government and states of Ohio and Pennsylvania.

William J. Wood of Evansville, Ind., a member of the Indiana Railroad Commission, attended the twentieth annual convention of the National Association of Railroad Commissioners in Washington last week. Mr. Wood was appointed on the committee to consider and report on the subject of grade crossings. Mr. Wood addressed the meeting on the subject of trespassing on railroads, which he regards is as important as that of grade crossings. He asserted that 173 persons were killed in Indiana last year while trespassing on railroad property, and he insisted that something be done to keep the public off the railroad rights-of-way.

The Earl of Granard, assistant to the British postmaster-general, has been in New York city studying the American postoffice, telegraph and telephone systems. He coincides in the general belief that the telephone service of the United States is far ahead of that of Great Britain.

Mr. P. A. B. Widener, the Philadelphia traction magnate, has announced that both his son, George D. Widener, and himself will resign from the Union Traction Company of Philadelphia unless a $5,000,000 bond issue contemplated by the board of directors is accomplished. Mr. Widener feels that President John B. Parsons, J. J. Sullivan, William H. Shelmerdine and George H. Earle, Jr., will also tender their resignations from the Union Traction board. The stockholders predict that Robert Balfour will be elected to succeed President Parsons. Mr. Widener regards the bond issue as a necessity to the continuance of the traction company's operation.

In its report of the international electrical congress held last month at Marseilles the London Electrician says: "France, Italy and Switzerland were all numerously represented at this gathering. Belgium, Germany, Austria and Russia were well in evidence. Most of these countries had sent official government delegations, as had also Sweden, Canada and the United States of America. The last-named delegation was headed by Mr. Mailloux, who was very active in speaking in several of the sections, giving information as to results attained in America, and urging the adoption of practice similar to that followed in America. Mr. Higman of the Canadian government delegation also spoke, but did not take much active part in the proceedings."

ELECTRIC LIGHTING

Elsberry, Mo., has voted bonds for the construction of an electric-light plant.

At Oakland, Iowa, Guy Gilson and others propose the erection of an electric power plant to cost $60,000.

At Sutton, Neb., the Electric Light and Power Company has been incorporated with a capital stock of $25,000.

Plans are being perfected to supply the buildings of Yale University at New Haven, Conn., with electric light and power from a new central plant. Estimates fix the expense at about $60,000.

East Side merchants of Aurora, Ill., have organized a public improvement association, whose purpose is to secure a special electric street-lighting plant for their own neighborhood.

The Des Moines (Iowa) Electric Company, incorporated under the laws of Maine, with a capital stock of $5,000,000, has taken control of the Des Moines Edison Light Company. New stock to the amount of $1,125,000 has been issued.

An experimental farm at Bellecrest, near Northport, L. I., where plant growth will be stimulated during the hours of darkness by electric light, is to be established by Madame Davidoff, a magazine writer.

The gross earnings of the Kansas City Railway and Light Company for June, July and August were $1,576,542 in 1908, compared with $1,552,902 in 1907 and $1,398,341 in 1906. The net earnings for 1908 were $653,735 and the surplus $188,386, compared with $742,885 and $279,151, respectively, for 1907.

Norfolk, Neb., took advantage of the recent rush of homeseekers through the town to advertise its modern advantages by keeping festoons of decorative electric lights burning the entire night. The lights were strung across the main street at short intervals and attracted the attention of the hundreds of homeseekers going through.

The committee on resolutions of the trans-Mississippi commercial congress at San Francisco last week agreed not to indorse the granting of perpetual waterpower rights, whether located in or out of forest reserves, and that the right of disposal should not be conferred upon the state in which they are located.

The officials of the Southern Colorado Power Company have applied to the Trinidad City Council for an increased demand of water when the plant is enlarged. The company is now using 15,000,000 gallons a month, for which it pays seven cents for 1,000 gallons, and wishes to secure ten times as much water at the rate of two cents for 1,000 gallons.

The Indiana and Michigan Electric Company has dropped the gates of its dam across the St. Joseph River at Berrien Springs, Mich., and when the water reaches the maximum height a lake covering about 1,600 acres will have been formed. The level of the river will be raised for about 10½ miles, or to Buchanan, Mich. The dam is 1,600 feet long and 20 feet high and is constructed of steel and concrete. It will develop about 10,000 horsepower. Most of this will be distributed in South Bend, Ind. The company has dams at Elkhart, Hen Island, Buchanan and Berrien Springs, the aggregate development of which is about 25,000 horsepower.

The Bureau of Manufactures, Washington, D. C., has on hand (file No. 2694) a request from a South African municipality for proposals for the installation of an electric-lighting system for the purpose of lighting its streets and public buildings. The streets are to be lighted partly by arc and partly by incandescent lamps. Apart from the churches, schools, colonial, imperial and naval buildings, it is thought that owners of many private houses will avail themselves of the opportunity of entering into arrangements with the successful bidder. All tenders should be sealed and forwarded so as to be received not later than November 1, 1908.

ELECTRIC RAILWAYS

Several sections of the electric railway at Rosario, Argentina, have been completed during the year. In all there will be 75 miles of track. The total cost of the road is $3,600,000.

The Toledo and Indiana electric railway is to be extended from Bryan to Butler, Ind. The road will then have a through route to Fort Wayne and Indianapolis, and, later, to Chicago.

A project to build a third-rail interurban line from Little Rock, Ark., south to Sheridan, branching to Hot Springs and Pine Bluff, has been planned by the Central Arkansas Electric Railway Company of Pine Bluff.

The Cia. Productora de Hielo y Electricidad, R. J. de Morambert, president, is to build an electric-light and power plant and an ice plant in Sta. Rosalia, Mexico. Work is now being commenced on the light and power plant.

Manhattan, Kan., has granted an electric street-railway franchise to W. R. West of Kansas City and associates. J. C. Hessin and others have purchased the local electric-light plant, having been given a 20-year franchise.

It is reported that the stock of the Mattoon-Charleston (Ill.) Interurban line is being bought up by the capitalists who are to finance the Mattoon, Shelbyville, Pana and Hillsboro. The plan proposed makes the Mattoon-Charleston line, as well as the Mattoon-Hillsboro proposed line, a part of the trunk line between Indianapolis and St. Louis.

The Engineering Construction and Securities Company, Chicago, and H. S. Rattenborg, Atlantic, Iowa, who were associated in the construction of the railway from Atlantic to Kimballton, have secured a contract for the surveying, financing and construction of a 17-mile electric railway from Clarinda to Blancherd or Elmo. The surveying corps has started, and it is expected that the road will be in successful operation within a year.

The directors of the Des Moines, Winterset and Creston interurban railway have contracted with the Interurban Company of New York (a construction company) for the disposal of $1,500,000 of the bonds and the construction of the 65 miles of railway, provided that $100,000 more be subscribed for stock in Des Moines. The construction company, through Patrick Hirsch, its chief engineer, has already entered the field to make a thorough and accurate estimate of the cost of the work.

The state laws of Ohio prohibit municipal ownership, but this point was circumvented by a plan just adopted as the result of several weeks' negotiations, which provides that the Cleveland street-railway lines shall in the future be operated exactly as if owned by the city. The stock of the Municipal Traction Company in the leasing company, which is operating the lines upon a three-cent fare basis is to be placed in the hands of a board of trustees, who will consist of the board of directors of the leasing company and several citizens who are to represent the public. All profits accruing to the leasing company are to be turned over to the city.

Newspaper dispatches report that E. H. Harriman has pledged $14,000,000 to enable the Erie Railroad to electrify its New Jersey suburban service. A great electrification program now practically is under way, and it has been announced that the new construction and equipment would be timed to make possible electric trains when the Bergen cut is completed within a year. At the present time the Erie Railroad is operating a successful electric line between Rochester and Mount Morris over its steam roadbed. The Rochester electrification is the Westinghouse single-phase system with overhead trolley, and the current comes from Niagara Falls.

Mayor Fred A. Busse of Chicago has declared "electric trains will be run within the city limits on the Illinois Central tracks before I finish my term." Beginning six months ago the mayor ordered prepared at the suggestion of Dr. W. A. Evans, city health commissioner, a complete report of the expense, feasibility and advantages of railroad electrification and this voluminous pamphlet, comprising 300 pages, is now in the process of being printed. In the mayor's personal opinion not only the Illinois Central but all lines entering the city should be electrified.

The conversion of the Berlin Stadtbahn to electric traction will be commenced shortly. The total cost of electrification is estimated at 180,000,000 marks (approximately $45,000,000). The plans have been drawn up entirely by the Berlin Railway authorities, with the exception of the cost estimates, for which the assistance of the large electrical firms was allowed. The total length of single track to be electrified amounts to over 300 miles, including the Stadt and Ringbahn and the suburban railways. It is proposed to connect the Potsdam and Stettin stations on the suburban railways by an underground line.

TELEPHONE

A. C. Bowe has been granted a franchise at Bird Island, Minn., for a local telephone exchange.

The Northwestern Telephone Exchange Company contemplates rebuilding the local exchange at Park Rapids, Minn.

The Southern Bell Telephone Company recently purchased the Statesboro (Ga.) exchange and will make extensive improvements.

Cloud Chief (Okla.) Telephone Company has been organized with $10,000 capital stock. The directors are headed by J. B. Baldwin.

The El Dorado (Ark.) Telephone Company has been formed with a subscribed capital stock of $50,000. W. P. Ritchie heads the incorporators.

The Farmers' and Merchants' Telephone Company of Marshalltown, Iowa, has been incorporated with a capital stock of $250,000. B. F. Cummings is president.

At Nevada, Iowa, a merger of the Nevada Mutual, the Roland Mutual, the Cambridge Independent, the Maxwell and the Short Line telephone companies has been effected.

The Northwestern Mutual Telephone Company has been incorporated at Crofton, Neb., with a capital stock of $5,000. W. W. Crandall is secretary.

The Wisconsin Telephone Company is to expend $100,000 in improvement and construction of lines along the shore of Lake Michigan from Milwaukee to Fond du Lac, Neenah and Menasha.

The Chicago Telephone Company has been sued for $100,000 by Mrs. Ruth Hall, who alleges her ear drums were ruptured as the result of a violent click in the receiver, caused by some disturbance in the line.

The Rollingstone (Minn.) Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are Henry Speltz, N. M. Reiland and Andrew Rinn, Jr., of Rollingstone.

The Tri-City Telephone Company has let the contract for the erection of an exchange building at Clinton, Iowa, to be two stories in height and fireproof in every particular. The building will cost $10,000, and the company expects to expend $100,000 in improvements in the next few months.

The Fredericksburg and Wilderness Telephone Company of Fredericksburg, Va., has been chartered with $5,000 capital by T. F. Morrison, president, who heads the incorporators. The company will operate a telephone system in Louisa, Culpepper, Orange and Spottsylvania counties.

The Farmers and Merchants' Telephone Company of Marshalltown, Iowa, with a capital stock of $250,000, has been granted a charter by the secretary of state. It will incorporate into one company the lines in Calhoun, Dallas, Hamilton, Story, Greene and other Central Iowa counties. A franchise was granted the company in Marshalltown, provided it expends $50,000 during 1909 putting the new plant in shape.

At a meeting of the stockholders of the United States Telephone Company, held at Cleveland, the Cuyahoga Telephone Company of Cleveland and the Citizens' Telephone Company of Columbus were merged. The new company will operate with a capital between $5,000,000 and $10,000,000, and will take over the three Independent companies on a lease for 999 years. The merger places under the control of the operating company over 50 per cent. of the Independent telephones and about 75,000 of the 325,000 telephones in Ohio.

The report of the Associated Bell operating companies for August shows a total revenue of $9,950,400 from telephones and $452,900 from other sources. Operating and maintenance expenses were $7,292,500, leaving a balance available for dividends of $2,496,300.

PUBLICATIONS

Electrical Engineering, published weekly in London, has made a remarkable reduction in its subscription rate—from 12 cents to 2 cents a copy, or from $5.16 to $1.60 a year. The latter figure includes the postage.

The Central Electric Company of Chicago is distributing an attractive circular devoted to its new guaranteed electric flatiron. Considerable detailed information is given as to the mechanical and electrical design which should be of interest to those who use this class of apparatus.

"What the Other Fellow Says," is the title of a collection of reprints of commendatory letters received by the Le-Valley Vitæ Carbon Brush Company, New York, concerning its product, the Le-Valley Vitæ carbon brush. These brushes are advertised as lasting from four to ten times as long as the ordinary brush while carrying 400 per cent. more load.

The American Conduit Company, 140 Nassau Street, New York, has mailed a card to those likely to be interested, showing the application of its socket-joint conduit wrapped with unbleached cotton strip and dipped in a sealing compound, making a strong watertight socket joint when it is desired to dispense with concrete. A more complete description is given in Bulletin 252.

Bulletin B of the Nernst Lamp Company, Pittsburg, Pa., is ready for distribution. It contains complete information about the multiple-glower lamps made on the new Westinghouse-Nernst system. Besides illustrated descriptions of these lamps and their parts, the bulletin contains a photometric chart and a complete price-list of the great variety of sizes and types for direct and for alternating currents.

Reactions, the quarterly publication devoted to alumino-thermics, issued by the Goldschmidt Thermit Company, New York, for the current issue contains a number of photographs of interesting and difficult welds made by the use of thermit. Dr. Hans Goldschmidt, the inventor, has a paper on "New Thermit Reactions," in which the main feature is the substitution of other elements or alloys for aluminum in the reaction.

SOCIETIES AND SCHOOLS

Massachusetts Institute of Technology, Boston, has added the study of Esperanto, the universal artificial language, as a regular course in the curriculum. "Tech" is one of several colleges which have this year made this addition; among the number being Clark College (Worcester), University of Chicago, Northwestern University and the University of Wisconsin.

At a meeting of the board of directors of the American Institute of Electrical Engineers, held on October 9th, 112 associate members were elected. The following-named associates, upon the recommendation of the board of examiners, were transferred to the grade of membership: Robert Albert Hadfield, Mayfair, W., England; Edward Belden Merrill, Winnipeg, Canada, and William Noble Dickinson, Jr., New York city.

The Electric Club of Chicago is making a campaign for an increased membership, and to this end is enlisting the aid of its old members in the work of getting eligible electrical people to join. The Electric Club will have speakers at each of the weekly Wednesday meetings, when it holds luncheons in the grill room of the Chicago Automobile Club. Sometime the club wants to build a house of its own. A. O. Einstein, 103 West Adams Street, is acting chairman of the membership committee.

MISCELLANEOUS

Russia may assess a tax upon the production of electrical energy. This is expected to yield about $5,000,000 annually.

A Turkish bath can be self-administered at home by setting an electric toaster under a chair and enclosing the toaster and one's body in a rubber blanket. By this method, which seems to be becoming popular, a very comfortable and hot bath is enjoyed.

A useful preventive for spontaneous ignition of coal in storage, is a small cylinder containing compressed carbon dioxide, fitted with a fuse plug melting at 200 degrees F. A cylinder one foot long and three inches in diameter is said to be sufficient to take care of eight tons of coal.

A demonstration of a system of wireless operation of the keyboards of linotype machines was given in London last month by the inventor, Mr. Hans Knudsen. The apparatus consists essentially of two traveling brushes moving synchronously over a row of contacts at the transmitting and receiving stations, respectively.

Telegraph tolls in Oklahoma have been cut to a flat rate of 25 cents for 10 words, with two cents for each additional word, day rate, and one cent night rate, to all points within the state by order of the corporation commission. The order also requires every telegram to show the time of filing and receipt, so that the recipient can tell for himself whether there has been any delay in delivery.

The fourth annual Chicago Electrical Show, to be held in the Coliseum January 16th to 30th, 1909, will far surpass anything ever attempted in the line of electrical shows, judging from preparations now being rapidly made. Weber's Prize Band, which rendered such fine music at the last show, has been re-engaged. All indications point to a big boost for the electrical industry in general through the medium of this great exhibition.

The Indiana Manufacturers and Shippers' Association has declared for a law to create a public utilities commission, modeled after the New York law. The measure, if it becomes a law, will not only confer additional powers looking to the control of railroads, including both steam and interurban lines, but will bring under state control all express and telephone companies and all corporations furnishing water, gas, heat, power and electricity.

A five-room cottage, with a basement, built, painted, plastered, wired for electric lights and ready for occupancy in less than 12 hours was accomplished in East St. Louis, Ill., last week. Before 7 o'clock the site of the house was a vacant lot. In an hour and a half the foundations were completed, and three hours' work brought the house to the ground-floor level. By noon the roof was well under way, the framework for wall and ceilings completed and ready for lathers, plasterers, plumbers and electricians. The house cost $2,000.

An examination will be held on November 9th for the position of electrical engineer in the Technologic Branch of the United States Geological Survey at a salary ranging from $1,620 to $3,000 per annum. It is desired to secure persons who have had broad training and experience in electrical engineering, especially in connection with coal-mining operations, and who will be fully qualified to undertake original investigations into the conditions under which electricity may be safely used in coal mining. Approximately equal weights will be given to the qualifications of education and technical training, professional experience in electricity as applied to coal mining and experience in general electrical work. Applicants should at once apply to the Civil Service Commission, Washington, D. C., for application form 304 and special form.

The second of the Yukon Gold Company's electrical conveyors was started on Bonanza Creek, in the Yukon, several weeks ago. The material for the plant has been in Dawson City since early this year, but the assembling was not begun until June. The erection of this conveyor was accomplished in much shorter time than that of the first. Both conveyors have a nominal capacity of 3,500 cubic yards every 24 hours. The bucket line works in a "sump" hole, gathering the gravel, which is washed down by streams of water. As the gravel is conveyed to the top of the elevator frame it is dropped into a large flume, carrying 14 sluices of water, where it is washed and run over a set of riffles and out to the tailing pile. The third of these electrical conveyors is now being installed at No. 23, below Bonanza, and will be in operation before the end of September. Robert Moncrieff of Dawson City has had charge of the construction of the three conveyors.

TRADE NEWS

Germany's electrical imports from the United States during the eight months ended last August amounted to $126,075, compared with $339,938 for the corresponding period of 1907.

The B. F. Sturtevant Company, Boston, Mass., has been awarded the contract for furnishing and erecting fans, electric motors and heaters for the Senate Office Building, Washington, D. C. The contract price was $13,985.50.

Bids are asked for the construction of two new postoffice buildings, including electric conduits and wiring in each case. One is at Eugene, Ore., and the date of opening bids is November 7th, and the other is at New Ulm, Minn., and the date is November 18th. Further information may be obtained from the supervising architect of the Treasury Department, Washington, D. C., or from the custodians of the respective sites.

The W. S. Hill Electric Company of New Bedford, Mass., manufacturer of switchboards and switchboard parts, has been purchased by the Taunton-New Bedford Copper Company of Taunton, Mass., and will be known as the electrical department of the latter company. Mr. Charles S. Mendell, treasurer and general manager of the Hill company, will have charge of the Copper company's new department. The factory will be removed to Taunton in several months, when buildings are prepared there.

Mr. Allen L. Hasse of Chicago, familiarly known as "Bracket Al," has announced his resignation as sales manager for the Peirce Specialty Company of Elkhart, Ind., a position which he has held for several years. Mr. Hasse has signed a contract with the Harvard Electric Company, 66 West Van Buren Street, Chicago, and 136 Liberty Street, New York city, as general sales manager, and will pay particular attention to developing the Harvard patent steel bracket and other Harvard construction specialties.

Bids will be received until October 24th by the city clerk at Elsberry, Mo., for furnishing and installing a municipal electric-lighting plant, consisting of the power house, boilers, engines, dynamos, transformers, pole line, street lighting and wiring system. Bids should be accompanied by a certified check for five per cent. A 50 per cent. bond will be required. Plans and specifications are on file at the office of the city clerk at Elsberry and at the office of the engineer, W. A. Fuller, Chemical Building, St. Louis, Mo.

The Massachusetts Chemical Company announces that its New York office has been moved from 237 Broadway to the Hudson Terminal Building, 30 Church Street. Mr. A. G. Cozzens continues as sales agent. At the new address the well-known line of electrical tapes, insulating fabrics and compounds and molded rubber goods will be carried to fill emergency orders. The former telephone number, 3440 Cortlandt, is retained. The offices are on the third floor, just at the bridge connecting the two halves of the building.

The many friends in the incandescent-lamp field of Mr. Cecil R. Wood will be interested to know that he recently severed his long connection with the Moline (Ill.) Incandescent Lamp Company, and has accepted a position with the Westinghouse Electric and Manufacturing Company at Chicago. Mr. Wood, it will be recalled, for a number of years was in close touch with the incandescent-lamp industry throughout as many as 16 different states, particularly in the West. He will now represent the Westinghouse lamp department, and his territory will be chiefly Central and Northern Illinois and Southern Iowa. Mr. Wood is known for his excellent work for his old company. The ease with which he makes friends and the firm hold with which he has retained the good-will of so many buyers would indicate that the Westinghouse company has secured a valuable man. The Westinghouse lamp department and Mr. Wood are to be congratulated on their choice.

The Pittsburgh Transformer Company requests the Western Electrician to publish the following statement: "In the United States Circuit Court for the Western District of Pennsylvania, held at Scranton, Pa., October 2, 1908, Judge Robert W. Archbald handed down a decision in favor of the Pittsburgh Transformer Company in the suit of the Westinghouse Electric and Manufacturing Company for infringement of the so-called 'Stanley patent' No. 469,809. The Westinghouse Electric and Manufacturing Company having filed a motion for preliminary injunction against the Pittsburgh Transformer Company, Judge Archbald, immediately after the conclusion of the hearing on the above date, handed down his decision from the bench, holding in effect that infringement was not shown, and the complainant's motion for injunction was denied. The above patent has been the subject of a great deal of litigation during the last 12 years, but it is important and interesting to note that the above decision of Judge Archbald disposes of this patent so far as it relates to the transformers manufactured by the Pittsburgh Transformer Company."

BUSINESS

The Wagner Electric Manufacturing Company, St. Louis, Mo., issues bargain list No. 8 of second-hand alternating-current motors in stock, detailing power, speed voltage and price. These motors have been cleaned up, refinished, repaired where necessary, and are sold at low prices with the same guarantee given on new machines.

The rectifier invented by Mr. T. J. Murphy and described elsewhere in this issue is manufactured by the Murphy Electricity Rectifier Company of Rochester, N. Y. This company is about to place on the market several different types of these rectifiers applicable to different uses, and asserts that their simplicity of construction makes possible prices which will be less than any other rectifier of like capacity.

The entire product of the Rail Joint Company, New York, up to the close of September is a total output sufficient to equip 50,000 miles of track, enough to build a double-track railway around the globe. This total covers shipments made during the last 14 years throughout the United States and foreign countries. The Rail Joint Company makes base-supporting rail joints for standard T-rail and girder rail sections, and insulating joints to meet conditions for track use at terminals and for signal work.

DATES AHEAD

Western Association of Electrical Inspectors, annual meeting, Chicago, October 20th to 22d.

Illinois State Electric Association (annual convention), Illinois Hotel, Bloomington, October 27th and 28th.

American Electrochemical Society (fall meeting), New York city, October 30th and 31st.

Association of Car Lighting Engineers (first annual convention), Chicago, November 16th to 21st.

Chicago Electrical Show (fourth annual), Coliseum, January 11th to 23d, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) October 6, 1908

900,160. Motor-vehicle Truck. Rodolphus Fuller, Detroit, Mich. Application filed November 21, 1906.

An electric motor operates a driven shaft through a variable-speed transmission gear and this drives the rear wheels through a differential gear.

900,165. Progressive Cut-out Mechanism. Jay H. Hall, New York, N. Y., assignor to the Electric Controller and Supply Company, Cleveland, Ohio. Application filed March 18, 1908.

A rotary automatic cut-out for a motor is provided with means for returning the movable contact to initial position after each operation of the cut-out.

900,169. Apparatus for Electroplating Metal Sheets. Henry L. Hollis, Chicago, Ill. Application filed August 1, 1907.

Mechanism is provided at the top of the vat for holding and moving the sheets from one end of the vat to the other.

900,192. Electric Furnace. Robert McKnight, Pittsburg, Pa. Application filed August 28, 1906.

A rotating tubular furnace has an electrically heated firebox of conoidal shape placed at the end of the tubular furnace body. There are also means for passing a draft through the firebox into the furnace.

900,207. Electric Furnace. James H. Reid, Cornwall, Ontario, Canada, assignor of one-half to Stephen Lemuel Tingley, Ottawa, Canada. Application filed April 1, 1907.

This furnace comprises a series of separate and superimposed units, each unit discharging into the one below it, and means for creating an electric arc centrally within each unit.

900,208. Electric Laundry Iron. Earl H. Richardson, Ontario, Cal., assignor to the Pacific Electric Heating Company, Ontario, Cal. Application filed December 2, 1907.

The iron has two members, a heating unit between the members, a thermic fuse in circuit with the heating unit, and a fuse support unattached to the members.

900,215. Automatic Train-stop. Hiram G. Sedgwick, Mill Valley, Cal. Application filed September 4, 1907.

In this train-stopping apparatus there is embodied a brake-applying circuit, a circuit-breaker for the same and means for manually operating it, means for automatically restoring the circuit-breaker to normally closed position when released, and a registering device.

900,238. Telegraph Key. James Z. Tucker and Lawrence V. Tucker, St. Louis, Mo. Application filed December 16, 1907.

Details of an operator's key are described.

900,265. Supporting Mechanism. George Cutter, Winnetka, Ill., assignor to the George Cutter Company, Chicago, Ill. Application filed September 10, 1904.

This is a pulley housing for an electric street-lamp hanger.

900,266. Hood and Reflector. George Cutter, South Bend, Ind. Application filed October 30, 1907.

The lower flange of a hood for a cluster of incandescent lamps is inturned so as to detachably hold a reflector.

900,273. Electric-railway Signal System. Thomas M. Freeble, Latrobe, Pa. Application filed June 7, 1907.

An automatic brake-applying system comprises an electric clutch controlling the brake valve, a generator on the locomotive and a signaling circuit governing the whole.

900,278. Electrolytic Alternating-current Rectifier. Arthur S. Hickley, Manasquan, N. J. Application filed November 12, 1907.

The electrolyte contains glycerine for preventing oxides and precipitates forming and collecting in the cell.

900,279. Electrolytic Alternating-current Rectifier. Arthur S. Hickley, Manasquan, N. J. Application filed January 16, 1908.

This cell is constructed like a steam radiator, the electrodes passing through the sections at the top and bottom. The object is to create an active circulation so as to dissipate the heat. (See cut on next page.)

900,289. System of Control for Electric Motors. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company. Application filed December 4, 1905.

An electric motor that may be operated by either alternating or direct currents is provided with an auxiliary field-magnet winding that remains open-circuited when the motor is operated by alternating currents, but which is closed-circuited on itself directly after the motor is operated by direct currents.

900,292. Electric Curling-iron Heater. Wynn Meredith, San Francisco, Cal., assignor to the Pacific Electric Heating Company, Ontario, Cal. Application filed September 25, 1907.

A heating coil is wound on a tube into which the iron is placed. Around the coil is a thick layer of heat insulation and over this a perforated shell.

900,295. Electric Heating Device. William C. Mortensen, Salt Lake City, Utah, assignor of one-half to Joseph R. Harris, Woodruff, Idaho. Application filed April 6, 1908.

An urn has a heating chamber containing electric lamps.

900,298. Rail Bond. Archie W. McConnell, Anderson, S. C. Application filed August 4, 1908.

The bond comprises a plate clamped between the bond and a rail joint, a casing disposed about the bond and a copper lining carried by the casing.

900,304. Electromagnet for Telegraphones. Peder O. Pedersen and Valdemar Poulsen, Copenhagen, Denmark, assignors to the American Telegraphone Company. Application filed April 9, 1902.

Surrounding the record medium is a solenoid with a mantle constructed of a number of sections.

900,320. Circuit Interrupter. Cullen B. Snell, Bradford, Mass. Application filed February 18, 1907.

The operating device is yieldingly supported on a number of contact springs and controlled by an electromagnet with a vibrating armature.

900,340. Apparatus for Electroplating. John A. Yunck, South Orange, N. J. Application filed November 8, 1906.

The anode is dome-shaped to correspond to the base part of the bulb of meridian incandescent lamps, which it is designed to plate with silver.

900,344. Magnetic Operating Means for Camera Shutters. Arnold Bartels, Los Angeles, Cal., assignor of one-half to Rosa Hug, Los Angeles, Cal. Application filed June 10, 1907.

On the front board of the camera is mounted an electromagnet and a reel on which the extra wire is coiled. The camera also holds a dry cell.

900,359. Changing Batteries in Electrically Propelled Vehicles. Albert J. Doty, Mount Vernon, N. Y., assignor of one-half to Charles Berg, Philadelphia, Pa. Application filed February 3, 1908.

A truck is placed close to each side of the car. A mechanism pushes a newly charged battery from one truck against the battery on the car, thus displacing the latter onto the other truck.

900,370. Block-signaling System. John S. Holliday, Wilkinsburg, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Application filed February 21, 1908.

Transformers are arranged for impressing on the track rails signaling currents that differ 90 degrees in phase in adjacent blocks. Synchroscopic relays control the signals.

900,382. Moisture-proof Case for Insulated Wires. Adrian L. Joynes, Paducah, Ky., assignor of one-third to Charles L. Meyers, St. Louis, Mo. Application filed June 4, 1906.

A cable-loop junction box has a screw-threaded sleeve and a similar protecting hood.

900,386. Telephone Transmitter. Adolph G. Kaufman and Leopold J. Lippmann, New York, N. Y., assignors to the American Callaphone Company, New York, N. Y. Application filed January 19, 1907.

This multiple transmitter has a number of transmitting units, each comprising a thimble provided with a sound-receiving tube, a diaphragm holding member fitted into the thimble, and a spring for pressing this member toward the tube.

900,387. Telephone Receiver. Adolph G. Kaufman and Leopold J. Lippmann, New York, N. Y., assignor to the American Callaphone Company, New York, N. Y. Application filed February 7, 1907.

The receiver consists of a casing, a magnet supported therein, magnet coils and a diaphragm box carried by the magnet directly and independently of the casing.

900,392. Sound-recording and Reproducing Instrument. George Kirkegaard, New York, N. Y., assignor to Stilson Hutchins, Washington, D. C. Application filed November 18, 1899. Renewed March 5, 1908.

This is a form of telegraphone in which the record is made on a cylinder of magnetic material.

900,404. Telephone Desk Set. Ray H. Manson, Elyria, Ohio, assignor to the Dean Electric Company, Elyria, Ohio. Application filed August 23, 1907.

A special construction of the supporting stand is described.

900,416. Electric Glow Lamp. Walther Nernst, Göttingen, Germany, assignor to the Nernst Lamp Company, Pittsburg, Pa. Application filed March 29, 1898.

This patent covers a Nernst lamp glower containing a mixture of zirconium and thorium oxides.

900,420. Variable-speed Motor. Alvin A. Pifer and Charles E. F. Ahlm, Cleveland, Ohio, assignors to F. B. Wagner, Cleveland, Ohio. Application filed February 14, 1906.

The pole-pieces are in two sections, adapted to be moved away from or toward each other circumferentially about the armature. (See cut.)

900,426. Shade and Socket for Incandescent Lamps. Benjamin P. Rucker, Wilkinsburg, Pa. Application filed June 21, 1906.

A reflecting shade is provided with a cap or dome entirely covering the socket.

900,428. Alarm or Signal System for Engines and Motors. Walter S. Rush, Stillwater, Okla. Application filed October 4, 1907.

An electric alarm is sounded when the engine is not run in the direction that has been ordered.

Into the base of the rail a hole is drilled from below, into which fits a terminal stud of the bond. An expanding pin is wedged into this.

900,489. Telephone-exchange System. William W. Dean, Elyria, Ohio, assignor to the Dean Electric Company, Elyria, Ohio. Application filed October 18, 1906.

An automatic ringing system is described.

900,493. Appliance for the Cure of Rheumatism and Other Diseases. Daniel R. Dewey, Hamilton, Ontario, Canada. Application filed December 26, 1907.

A blue glass bottle encloses an electric incandescent lamp.

900,502. Electrode for Electrolytic Purposes. Paul Ferchland, Berlin, and Joseph Nussbaum, Charlottenburg, Germany. Application filed November 5, 1906.

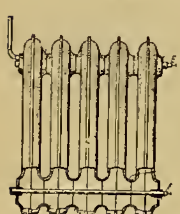
A non-conductor is first coated with lead peroxide and then has another layer of the same deposited on it electrolytically.

900,522. Picture-exhibition Device. James H. Gravell, Philadelphia, Pa., and George D. Farwell, Bridgeport, Conn., assignors of one-third to Percy C. Farwell, Bridgeport, Conn. Application filed November 1, 1907.

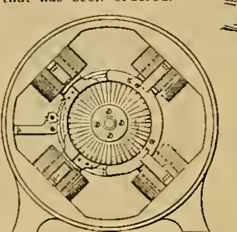
Mounted on an automobile is an exhibiting outfit. The motor propelling the vehicle can also drive a generator for furnishing the projecting lamp current.

900,525. Typewriter. Hermann Grössler, Berlin, Germany. Application filed January 9, 1908.

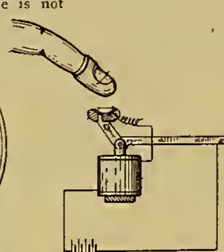
Both terminals of an electromagnetic operating circuit are exposed in the key so that the operator can connect



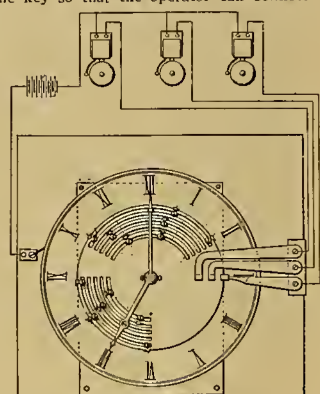
No. 900,279.—ELECTROLYTIC RECTIFIER



No. 900,420.—VARIABLE-SPEED MOTOR



No. 900,525.—ELECTRIC TYPEWRITER



No. 900,529.—ELECTRIC PROGRAM CLOCK

900,429. Electrosonator. Ryusai Sakamoto, Tokyo, Japan. Application filed April 11, 1907.

In a casing is a dry cell, an electromagnet and an electric plate spring adjacent the magnet.

900,435. Self-restoring Drop Relay. Frank M. Slough, Elyria, Ohio, assignor to the Dean Electric Company, Elyria, Ohio. Application filed May 29, 1907.

This magneto drop relay has a pair of electromagnets and a pair of armatures, one of which has three positions.

900,439. Lamp Guard. Peter Sorensen, Brooklyn, N. Y. Application filed December 19, 1907.

A wire cage guard for an incandescent lamp is described.

900,456. Block-signal System for Railways. James T. West, Rockingham, N. C. Application filed March 25, 1908.

The system is provided with electrical means for indicating to the operator the exact position and progress of a train.

900,458. Telephone-testing System for Party Lines. Charles S. Winston, Chicago, Ill., assignor to the Kellogg Switchboard and Supply Company, Chicago, Ill. Application filed May 31, 1905.

A means for testing whether the line is busy is provided.

900,476. Cover for Electric Batteries. Horatio J. Brewer, New York, N. Y. Application filed May 29, 1908.

The carbon electrode has a broad flat portion to fit into a slot in the cover. The hole for the zinc is inclined so that the zinc rod slopes away from the carbon.

900,478. Alternating-current Motor. James H. Bryson, St. Louis, Mo., assignor to the Wagner Electric Manufacturing Company, St. Louis, Mo. Application filed October 7, 1907.

A pair of windings is provided for producing auxiliary poles on one side or the other of the main poles.

900,486. Electric Furnace. Erik Cornelius, Trolhättan, Sweden. Application filed July 9, 1908.

The furnace has an annular chamber, a fixed electrode in and coextensive with the bottom thereof, and a movable electrode arranged to travel along the top of the chamber.

900,488. Rail Bond. Fred H. Daniels and Charles R. Sturdevant, Worcester, Mass., assignors to the American Steel and Wire Company, Chicago, Ill. Application filed December 1, 1906.

them by touching them with a thimble worn on the finger. (See cut.)

900,529. Program Attachment for Clocks. Julius W. Hansen, Princeton, Ind. Application filed February 28, 1908.

Each hand carries with it a dial upon which are trip pins that engage contacts in the circuits of the alarm bells. (See cut.)

900,542. Electric Generator. Gottlob Honold, Stuttgart, Germany. Original application filed April 30, 1902. Divided and this application filed June 16, 1905.

A magneto for sparking purposes is described.

900,545. Support for Cross-arms. John M. Humiston, Berwyn, Ill., assignor to the Steel Gain Manufacturing Company, Chicago, Ill. Application filed June 4, 1906.

An integral sheet metal plate has forwardly projecting flanges for engaging the cross-arm, and rearwardly projecting flanges adapted to partially surround the pole.

900,553. Telegraphic Relay. Isidor Kitsee, Philadelphia, Pa. Application filed February 14, 1908.

For the operation of this receiving relay a series of automatically interchangeable selenium cells is provided.

900,555. Controlling System for Electric Motors. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company. Original application filed December 4, 1905. Divided and this application filed February 24, 1908.

Auxiliary field windings are arranged to be energized in the same direction when the motors are run by direct current and in opposition when the motors are run by alternating current.

900,571. Secondary Battery. William Morrison, Chicago, Ill. Application filed June 8, 1903. Renewed December 9, 1907.

This storage battery has a zinc tank as one electrode, a horizontal positive electrode near the bottom of the tank and an alkaline electrolyte.

900,597. Process for Producing an Electrolytic Deposit of Metallic Chromium. Franz Salzer, Dresden, Germany. Application filed January 16, 1908.

The process employs a bath containing a mixture of chromic acid and chromoxide.

900,602. Massage Vibrator. William G. Shelton, Chicago, Ill. Application filed September 3, 1907.

An electric motor is carried by a handle for operating the massaging head, and a blower is driven by the motor and adapted to direct a current of electrically heated air upon the part being massaged.

900,612. Controller. Emmett W. Stull, Norwood, Ohio, assignor to the Allis-Chalmers Company. Application filed February 15, 1908.

The controller has two drums, each arranged to control one or more motors and a regulating resistance therefor.

900,613. Automatic Circuit Closer for Electric-lamp Holders. William D. Tickner and Lucius C. Tickner, Blanchardville, Wis., assignors of one-half to Charles M. Crowell, Blanchardville, Wis. Application filed February 3, 1908.

A set of terminals enter a chamber at different levels, so that a movable plunger causes the mercury therein to close various circuits.

900,641. Electric Fire Alarm. Harry Anderson, Haddonfield, N. J. Application filed February 14, 1908.

Two contact members are adapted to contact when a fusible link melts.

900,642. Typewriter Carriage-return Mechanism. Neal L. Anderson, Winston-Salem, N. C. Application filed January 29, 1908.

A series-wound electric motor is used here on direct-current circuits. On alternating-current circuits the field is connected in shunt with the armature.

900,658. Remote-control Electric Switch. Jay S. Bristol, Gillespie, Ill. Application filed April 6, 1907.

Oppositely disposed solenoids are arranged with a common plunger core to which the switch is rigidly connected.

900,663. Cross-arm Support. Waldo E. Callane, Flora, Ind. Application filed November 19, 1906.

A curved pole-engaging strap has integral inclined braces extending to the cross-arm.

900,676. Telephone-exchange System. Ray H. Manson, Elyria, Ohio, assignor to the Dean Electric Company, Elyria, Ohio. Original application filed February 1, 1907. Divided and this application filed May 29, 1907.

Harmonic signaling means are provided for supplying ringing currents of different frequencies.

900,679. Signal Apparatus. Walter T. Moon, Baltimore, Md., assignor to the Allis-Chalmers Company. Application filed January 5, 1905. Renewed March 6, 1908.

A switch is arranged to light a lamp on an indicator that shows the identity of the signal before the signal is electrically operated.

REISSUE.

12,860. Condenser and Process of Making Same. Maurice K. McGrath, Antwerp, Belgium, assignor to the Western Electric Company, Chicago, Ill. Application filed April 6, 1907. Original No. 825,405, dated July 10, 1906.

This condenser consists of a flat roll of strips of foil and paper reversely folded in a complete zigzag, paraffined and pressed.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired October 13, 1908:

460,958. Electric Signal for Railway Trains. L. Dunn, Fort Smith, Ark.
460,962. Electromagnetic Separator. G. M. Gouyard, Leadville, Colo.
460,963. Combined Electric Clock and Thermoscope System. H. J. Haight, New York, N. Y.
460,978. Electric Soldering Iron. W. Mitchell, Malden, Mass.
460,979. Electric Soda Fountain. W. Mitchell, Malden, Mass.
460,980. Electric Heating Core for Smoothing Irons. W. Mitchell, Malden, Mass.
460,991. Incandescent Electric Lamp. A. L. Reinmann, New York, N. Y.
461,023. Electric Battery. D. M. Lamb, Boston, Mass.
461,024. Composition for Electric Batteries. D. M. Lamb, Boston, Mass.
461,025. Electric Battery. D. M. Lamb, Boston, Mass.
461,026. Compound for Electric Batteries and Method of Preparing the Same. D. M. Lamb, Boston, Mass.
461,027. Electric Battery. D. M. Lamb, Boston, Mass.
461,052. Electromagnetic Brake. A. J. Shaw, Milwaukee, Wis.
461,057. Electric Railway. B. R. Shover and Wm. C. Dickson, Indianapolis, Ind.
461,104. Electric Signaling Apparatus. E. G. Mettler, Indianapolis, Ind.
461,122. Electric Door-operating Device. R. F. Troy, Madison, Wis.
461,135. Electric Inductional Transformer. Wm. Stanley, Jr., Pittsfield, Mass.
461,139. System of Distributing Electric Energy. R. Kennedy, Glasgow, Scotland.
461,140. Dynamo-electric Machine. R. Kennedy, Kilmarnock, Scotland.
461,144. Electric Arc Lamp. E. Thomson, Swampscott, Mass.
461,194. Signaling Switch and Circuit. J. W. Stover, New York, N. Y.
461,195. Connection for Electric Conductors. J. Dillon, Larchmont, N. Y.
461,228. Electric Car Motor. G. Willett, Englewood, Ill.
461,229. Electric Meter. G. R. Baldwin, New York, N. Y.
461,240. Dynamo-electric Machine. E. T. Gilliland, New York, N. Y.
461,294. Automatic-electric Pump. C. J. Van Depoele, Lynn, Mass.
461,295. Electrically Actuated Pump. C. J. Van Depoele, Lynn, Mass.
461,296. Armature for Electric Motors. C. J. Van Depoele, Chicago, Ill.
461,371. Fire-alarm Apparatus. W. C. Shaffer, Milwaukee, Wis.

WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, OCTOBER 24, 1908. No. 17

MOOSBURG-MUNICH 50,000-VOLT POWER PLANT

The municipal electricity works of the city of Munich, Germany, have been gradually developed from small beginnings 15 years ago to an extensive power plant.

When that city, in 1893, erected its first hydro-electric power plant on the River Isar, it was confined by an agreement with the gas company to an output of 300 horsepower. An extension of that plant was then effected in 1896, but it was then stipulated that the output could not be raised beyond a maximum of 600 horsepower apart from the current consumption for railway purposes.

Unhampered development did not begin until 1899, when entanglements with the gas company were finally eliminated. In that year the Isarthalstrasse electric power station, operated by steam engines, was put into operation in the southern part of the city. This central station included five generators, each of 800 kilowatts capacity, and supplied polyphase current at 5,000 volts, converted in sub-stations into direct current for railway and lighting purposes.

As the current consumption increased, this steam-operated plant proved unable to cope with the demand. Two hydro-electric power plants were therefore erected, one of which is situated in the southern part of the city on the upper Isar, close to Maria Einsiedel station. This power plant, which was placed in service at the end of last year, comprises three Siemens-Shuckert polyphase generators of 1,300 horsepower each.

The other power plant, the Uppenborn electricity works, near Moosburg (Fig. 1), which was also put into operation last year, is situated at about 54 kilometers to the northeast of Munich, on the lower Isar, and comprises three Siemens-Schuckert polyphase generators, each of which yields 1,400 kilovolt-amperes at a potential of 5,000 volts, being operated by turbines (Fig. 2) constructed by J. M. Voith. A fourth alternator of 210 kilovolt-amperes and 5,000 volts serves for supplying current to the town of Moosburg, while a converter set and a storage battery are used for the direct-current lighting plant of the power station.

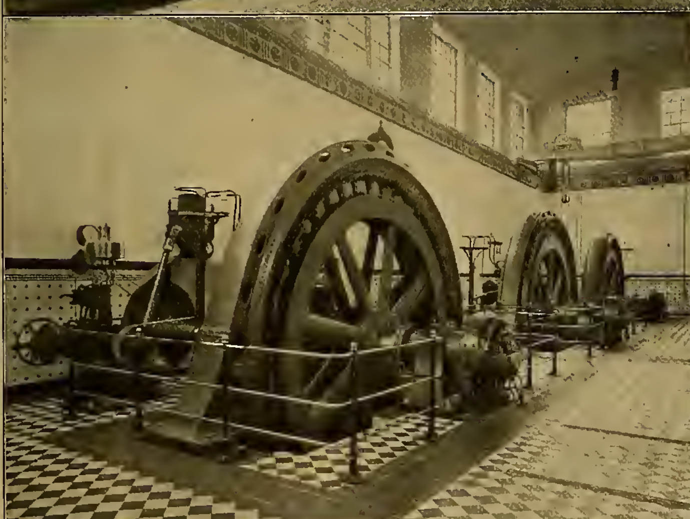
The current generated in the large machines is raised in two transformers of 2,000 kilovolt-amperes each to a potential of 50,000 volts, at which it is then conveyed to Munich over a transmission line 54 kilometers in length. This transmission line, constructed by the Munich Electricity Works itself, runs alongside the River Isar and comprises two parallel circuits, each composed of three copper wires of 16 square millimeters each. It terminates at the Hirschau transformer station (Fig. 3) erected in the northern part of the city of Munich, where the line potential is lowered to 5,000 volts by means of two transformers of 1,800 kilovolt-amperes each.

The protective devices for the high-potential line are practically identical with those employed in connection with the 50,000-volt power transmission plant from Kykkelsrud to Hatslund, Norway.

The choke coils inserted at the transformer station into each leg of each circuit are represented in Fig. 4. From these coils conductors branch off and lead to lightning arresters installed on the upper floor and to suitable ground connections. The choke coils may be seen at the left in Fig. 4. They are used for damping high-frequency oscillations and a water-jet grounding device affords a throttling protection against high-potential surges so that the horn lightning arresters are but seldom pressed into service.

The horn lightning arresters, installed in a special building adjacent to the transformer station, serve as safeguards against very strong atmospheric discharges; they are connected through a cut-out to the conductors and to the grounds through a water resistance. Similar lightning arresters are situated at the Uppenborn power station and in the middle of the transmission line near Achering, where the conductors can be divided into two portions by a sectionalizing cabin. Owing to the high tension, 50,000 volts, the safeguards against excessive potential were given especially ample dimensions.

The 5,000-volt switchgear comprises several removable switching cells, of which six are at present in operation. Two of these are used for the transformers and the four 5,000-volt cables leading to the city stations, respectively. The Hirschau transformer station is by these cables connected up in parallel to the steam-operated generating station in the Isarthalstrasse.



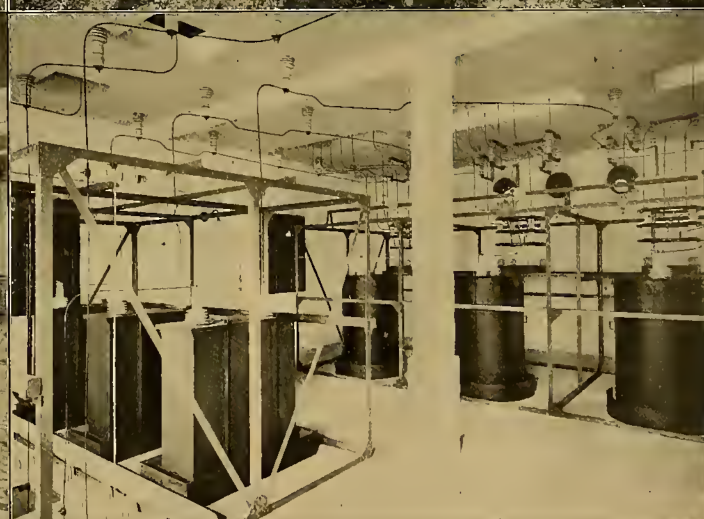


Fig. 1. Hydro-electric Generating Station Near Moosburg
Fig. 2. Generators in Moosburg Power House
Fig. 3. Transformer Sub-station and Lightning-arrester Cabin in Munich
Fig. 4. Protective Apparatus in Transformer Sub-station
MOOSBURG-MUNICH 50,000-VOLT POWER PLANT

ELECTRIC CLUB OF CALIFORNIA

At a meeting held on October 10th, at the Bismarck Cafe in San Francisco, the Electric Club of California was organized, to carry on work along the same lines as the Electric Club of Chicago. A luncheon will be held once a week, at which papers will be read dealing with matters of interest in the electrical business. The officers are: President, Henry F. Frosch; vice-president, A. E. Rowe; secretary, R. D. Holabird; treasurer, E. D. Poss.

REFLECTED LIGHTING IN A LONDON HOTEL

Many illuminating engineers contend that the ideal lighting of interiors is on the indirect system, where the lamps are entirely screened from view and throw their light against the ceiling and upper walls for reflection to the working plans below. For this purpose inverted arc lamps have been used with considerable success; also incandescent

ILLUMINATION BY REFLECTED LIGHT IN A LONDON HOTEL

lamps in troughs or grooves running around the room. The use of incandescent lamps placed in inverted pendants has been rare, however. The high efficiency of metal-filament lamps, combined with the fact that high-candlepower units are available, should make possible their use for reflected lighting in many cases.

An interesting installation on the above lines is described in the London Electrician. It is at the Inns of Court Hotel, Holborn, London. It should be noted that, previous to the adoption of the lighting scheme described later, experiments were made with enclosed arc lamps and an arrangement of reflectors. This proved entirely unsatisfactory for two reasons. The light emitted from the arcs was cold and almost repellent to the eye, and the feeding of the lamps at intervals caused either complete interruption of the lighting or an annoying flicker. Subsequently metal-filament lamps were suggested as more likely to give the desired effect. It had been rightly agreed that some form of reflected lighting was desirable, and consequently, although the arcs had proved unsatisfactory, the new lamps were to be given a trial before finally returning to the more usual but infinitely less beautiful method of scattered illumination. The prospects of the inverted system were, moreover, greatly enhanced by the lofty rooms and their general appointments.

By far the most beautiful effect has been obtained in the drawing room, which is a large room looking on to Lincoln's Inn Fields. The downward distribution of light is very good, and a person seated on any of the couches is able to read easily. Three fixtures are used for the illumination of the room and each contains 10 lamps radiating at an angle corresponding to that of the reflector below them. This reflector is of enameled iron and can be easily cleaned. The fixtures are given a pleasing and harmonious appearance by a special arrangement of basket-work which is hung below the lampholder fitting and reflector and is tastefully lined with silk. The other inverted fittings in the hotel are made up in this way and the effect produced is said to be charming to a degree.

The accompanying photograph taken by the light of the lamps themselves shows the lighting effect obtained in the hotel foyer, which has two 10-light fittings, but it has not been found necessary to use all the lights in each group. The illustration brings up well the even distribution of the light.

The Masonic Temple in the hotel has 10 fixtures installed for its illumination. They are of bronze of a special design selected to be in keeping with the character of the meetings held in the room. Each carries two 35-candlepower tantalum lamps in place of four 16-candlepower carbon lamps previously installed. The light distribution here is very even, and, as is the case with all the other inverted fittings, there are no shadows cast. It is noteworthy that the total energy consumption of these lamps is only six kilowatts, in contrast with 13.5 kilowatts required previously for the carbon-filament lamps. In all there are 27 inverted pendants installed in the hotel.

In addition to the pendants containing the metal-filament lamps there are four fixtures in the restaurant in which Beck flame arc lamps are used. These are hung round with basket fittings, which are lined with golden silk. There is no inverted reflector, but the direct rays of the arc are allowed to diffuse themselves through the cloth, giving a soft glow to the illuminating effect.

A NEW METHOD OF INDIRECT LIGHTING

A unique meeting of the Chicago Section of the Illuminating Engineering Society was held on the evening of October 15th in the apartments of Mr. A. D. Curtis, 4719 Kenwood Avenue, where a novel installation of indirect lighting has been carried out in each room. The subject of the session was a paper on "Indirect Illumination" by Messrs. Curtis and A. J. Morgan, describing this lighting system, which had been devised by the authors, with the assistance of Mr. J. R. Cravath. About 50 persons were present, several ophthalmologists and architects having accepted the invitation of the illuminating engineers. The excellent diffusion of the lighting system, avoiding glare, evoked commendation from those who inspected the illumination and experimented with the legibility of ordinary print in far corners of the room. As the increasing satisfaction of the indirect illumination grew upon the engineers, before the session was over many expressed the belief that the next few years will see many similar installations.

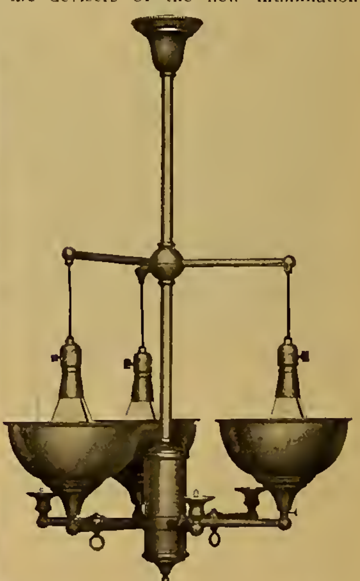
As carried out, the indirect system, practically demonstrated and described by Messrs. Curtis and Morgan in their paper, comprised special chandeliers with pendent sockets containing tungsten incandescent units. Mounted or hung beneath and semi-enclosing each lamp were bowl-shaped glass reflectors backed with a silver coating. These reflectors were concealed by ornamental bowls of spun brass. From the reflectors the light is thrown up against the white or cream-tinted ceiling, and from there cast in a diffused illumination throughout the entire room. The absence of any direct illuminant was at first deceptive as to the real intensity of illumination, but the ease with which ordinary print could be read in any part of the room showed that the illumination was comfortably sufficient. In reading the paper, Mr. Curtis admitted that while there is undoubtedly a loss of light incident to the reflection from the ceiling surface, the absence of any glare in the line of vision enables the iris to relax, admitting more light to the retina, so that, while the actual illumination in foot-candles may be lowered, the illumination for vision is increased.

Mr. Cravath, who assisted in the development of this indirect system, explained the effect of dark walls in cutting down the illumination. He advised that the lamps and reflectors should not be placed too close to the ceiling, lest the incident light rays striking the surface at an angle suffer in the reflection. Mr. V. R. Lansingh of New York gave an account of an indirect lighting scheme tried in that city in which the walls were light tinted. As the result of the strong illumination of the walls the eye had no resting place and severe strain followed rapidly. A combination of direct and indirect lighting was afterward used with success. He advised dark-tinted walls for the indirect system. With the exception of one bedroom this rule prevailed throughout Mr. Curtis' apartments. Prof. Morgan Brooks, professor of electrical engineering at the University of Illinois, expressed a lively interest in the innovation, though he observed that "the last word" had not yet been said on indirect illumination.

Mr. Morgan, one of the authors, explained the purpose of the fluted reflector to break up the images of the filament otherwise cast upon the ceiling. The reflectors, he said, are mirrored by an application of pure silver, a trade secret which required six years' work to perfect. The silver is backed by an enamel, and in testifying to the permanent quality of the brilliant reflecting surface obtained, Mr. Morgan cited a reflector that had been in use 10 years without tarnishing. A hole in the bottom of the reflector, he said, is for the double purpose of ventilation and allowing any dust that collects to drop out of the reflector and be caught in the brass bowl below.

Mr. George Loring of Cleveland, engineer for the National Electric Lamp Association, told of the advance in the manufacture of tungstens which will enable them to be burned in the upright position which the devisers of the new illumination scheme contemplate. Several ophthalmologists and architects who were present were called upon for opinions of the new illumination, and while each professional man viewed the physiological and artistic effects of the system from his own viewpoint, the general tone of the comment was favorable.

Bedroom Illuminated by Single-unit Fixture Containing One 60-watt Tungsten Lamp. Photographed by Light of the Unit



Three-unit Chandelier with Emergency Gas Outlets

A NEW METHOD OF INDIRECT LIGHTING

The University of Minnesota has increased the length of its engineering courses from four to five years. The added work consists of additional requirements in modern languages, economics and political science. The degree of B. S. will be given at the end of the fourth year and the degree of E. E. at the end of the fifth year.

AN AUTOMATIC CROSSING GATE

A novel automatic grade-crossing gate for electric railways has been brought out in Switzerland. It is so designed that when a car approaches the crossing electrical apparatus lowers the barriers across the roadway, and when the train has passed raises them by an inverse action of the mechanism.

FIG. 1. AUTOMATIC ELECTRIC CROSSING GATE IN SWITZERLAND

Thus there is no need for a watchman at the crossing, for the apparatus gives the required security and is less expensive to maintain.

The apparatus was first designed for lines using an overhead trolley. However, with modifications the device can be also applied to steam railroads, providing a source of current is available at the crossing.

In Fig. 2 is shown the mechanism of the electrically operated gates. The barrier itself is a long pole lowered across the roadway. A vertical channel-iron carries on a cast-iron bracket all the driving mechanism, including the motor, resistance coils and rheostat. The motor drives a large gearwheel fitted to a conical drum with a spiral groove for winding the cable. The end of the shaft serves as the suspension point for one end of the cable which passes around the pulley on the horizontal bar. Below and parallel to the axis of the drum is a spring brake.

The near end of the barrier bar which carries the counterweight is made of channel iron, while the barrier itself is a timber of light pine treated by creosoting. The counterweight is a cast-iron frame made to hold different iron weights for balancing bars from 10 to 30 feet in length. At the pivot of the bar is a drum on which is wound a cable which crosses the track over a set of pulleys and operates the swinging bar on the other side of the track. To protect the driving mechanism from the weather it is covered by a light housing which can be readily removed. Several incandescent lamps and an electric bell are used as visible and audible signals. The current for the bell, lights and motor is supplied through the contact of the bow trolley with an auxiliary wire paralleling the trolley wire. The length of this signal wire of course depends upon the usual speed of the train at the crossing in order to allow the apparatus to operate shortly in advance of the passage of the car.

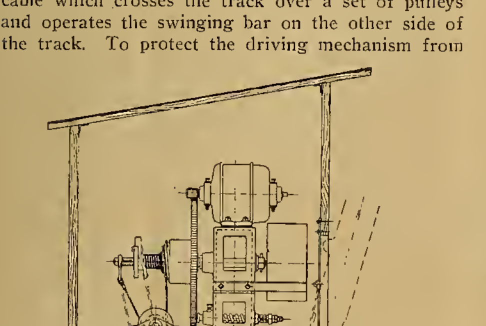


FIG. 2. MECHANISM OF AUTOMATIC CROSSING GATE

From the diagram, Fig. 3, the method of operating the apparatus will be clear. When the bow trolley T of the locomotive or car comes in contact with the auxiliary wire H, closely paralleling the main trolley wire F, the wire H is connected to the line. The resulting current operates the motor M, the incandescent lamps B and the electric alarm bell connected as shown. The motor is series wound and takes about one-tenth horsepower, running upon 120 volts at 400 revolutions per minute. In order to avoid the effect of variations in voltage

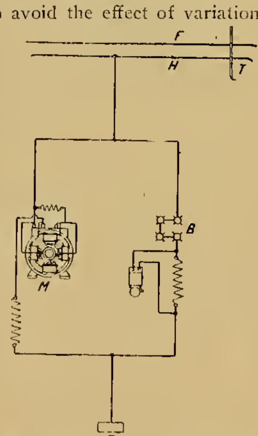


FIG. 3. ELECTRICAL CIRCUITS OF AUTOMATIC CROSSING GATE

in the line upon the motor speed of closing the barrier a shunt resistance is paralleled with the armature winding to diminish the influence of voltage fluctuation upon the motor. The lamps are placed at each side of the grade crossing and serve at the same time as lights and signals. The electric bell is connected in the lamp circuit paralleling a resistance.

The operation of the bar requires about 20 seconds. During this time the drum by its screw-thread is displaced in the direction of the shaft end and stops the braking action of the spring working upon the rim of the gearwheel. Before the bar has completely reached the horizontal position the cable winds upon the conical part of the drum. As the mechanical resistance is met the motor slows up and the bar is closed slowly at the end of its swing.

While the bar remains closed the current continues to traverse the motor and is not interrupted until the bow trolley leaves the auxiliary wire. Then the counterweight acts to bring the bar to the vertical position.

The first apparatus of this kind was installed near Montreux on Lake Leman upon the Montreux-Bernese Oberland electric road, and this crossing is shown in Fig. 1. It works in a satisfactory manner, it is said.

A REMARKABLE CONTRACT FOR ELECTRIC SERVICE

Perhaps no contract was ever executed for a greater amount of electric power, nor drawn up with more care and thoroughness, nor providing such a low rate for current (steam-generated), as that to which President Samuel Insull of the Commonwealth Edison Company has recently affixed his signature and providing for the sale of electrical energy which is estimated to amount eventually to about 40,000 kilowatts, for a period of nearly 10 years, to the Chicago City Railway Company, of which Mr. T. E. Mitten is president.

The Chicago City company, operating the extensive South Side street-railway system, has been buying the greater part of its power from the Edison company for some time, but by the present contract (originally bearing date June 1, 1908, but only executed a few days ago, after approval by the Board of Supervising Engineers) it declares its intention of taking "all the energy which it shall have occasion to use."

Inasmuch as it is estimated that at the beginning of the term the contract will govern business amounting to between $800,000 and $900,000 annually and at the end between $1,300,000 and $1,400,000, it is not strange that it has been prepared with the utmost care.. The document contains about 7,500 words, and is divided into 10 articles, several of these being again divided into sections.

In the first article the Edison company agrees to supply the current, which shall be three-phase, 25-cycle, 9,000-volt current unless otherwise stipulated. The railway company agrees to use the power for itself alone, except as otherwise provided.

The second article relates to the amount of current the Edison company must be ready to supply and as a preliminary explains how the "maximum demand" is to be ascertained, thus:

"From each of three consecutive days in each month there shall be selected two hours, of which one shall be the hour of greatest output (in kilowatt-hours) in the first half, and one the hour of greatest output (in kilowatt-hours) in the second half of the day from which it is taken, and said three consecutive days shall be such that the combined output of the six hours selected therefrom in the manner thus indicated shall be greater than the combined output of six hours similarly selected from any other three consecutive days in the month. One-sixth of the aggregate number of kilowatt-hours drawn and consumed by the railway company during the six hours selected as aforesaid from each month shall be taken and considered as the number of kilowatts constituting the railway company's maximum demand for such month."

This "maximum demand," so carefully determined, is used in fixing the standby capacity for succeeding months.

At all times during the first year of the term the Edison company shall stand ready to supply 21,000 kilowatts, together with an additional 9,000 kilowatts if required. After that an increased supply may be demanded on due notice, it being the intention that after the first year the minimum amount which the Edison company shall be obliged to be ready to supply, and upon which the railway company is to pay a minimum primary charge, shall not be less than 30,000 kilowatts. The Edison company shall actually supply so much of the standby amount as the railway company may desire to draw. The Edison company agrees to stand ready for increases and supply up to 10 per cent. for short periods in case of emergency, without further notice.

Terms of payment are set forth in Article III. The minimum primary charge is $1.25 per kilowatt per month, reckoned on 21,000 kilowatts, and all additional standby capacity. Further, the railway company is to pay 0.415 cent per kilowatt-hour for all current used up to January 31, 1910; after that the consumption charge is to be 0.4 cent per kilowatt-hour.

Article IV. gives technical details. Underground transmission lines are to be maintained by the Edison company to nine sub-stations maintained by the railway company. Current for South Chicago shall be transmitted at 20,000 volts. Additional substations may be erected in the city of Chicago, not more than 15 miles from the City Hall. Average loss in transmission shall not exceed five per cent. under conditions of unity power factor.

Elaborate provisions in relation to metering are made in the fifth article. One three-phase meter or three single-phase meters may be used on any transmission line. Meters are to be tested and calibrated monthly in the presence of representatives of both parties. Variation of not more than two per cent. under test shall be passed as normal.

Default in payment is dealt with in the next article, while the seventh article stipulates that the Edison company shall not be liable for damage for non-delivery of current. Differences of opinion in interpreting the contract shall be settled by arbitration, as provided in Article VIII.

The railway company shall have as low a rate as any other consumer, other things being equal. This is stated in the ninth article, while the tenth and last article provides that the railway company will not itself generate current nor buy power from any other source.

LIGHTING COUNTRY HOMES BY PRIVATE ELECTRIC PLANTS[1]

By T. H. Amrine

The farmer and the resident of the small country town have long felt the need of the electric lamp. They appreciate the adaptability, the cleanliness and the convenience of this method of illumination and would gladly adopt it in their homes, if possible. However, they live too far from any central-lighting station to be able to buy power at a reasonable cost. The private lighting plant has been a possibility, but until recently the cost has been prohibitive for the great majority of people. The present state of development of the storage battery and the wonderful improvements that have been made in incandescent electric lamps during the past year have opened up to residents of the country new possibilities in the way of home lighting by private electric plants.

The great difficulty in the design of a small lighting plant has always been the size and cost of a storage battery outfit. To start up the engine and dynamo every time a few lamps are required is too inconvenient to be considered. Consequently it is necessary to have some means of storing the

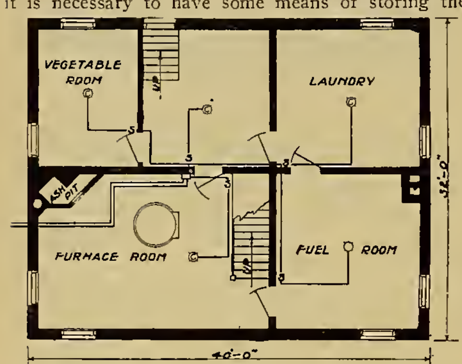


Fig. 1. Basement Floor Plan

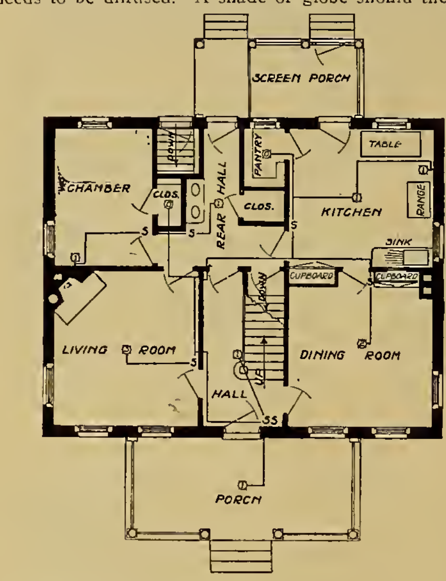


Fig. 2. First Floor Plan

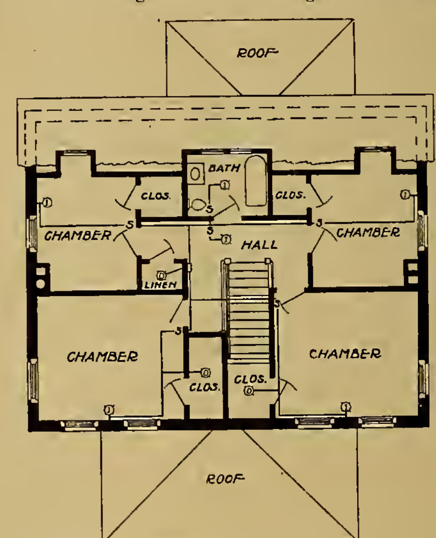


Fig. 3. Second Floor Plan

LIGHTING COUNTRY HOMES BY PRIVATE ELECTRIC PLANTS

electric energy so that the power can be generated when convenient and used when required. The storage battery makes this possible, but where the ordinary carbon-filament incandescent lamps are used as the light-producing source we are obliged to have a large and expensive battery. Each cell of storage battery will give an average pressure or voltage of two volts. Hence if 110-volt lamps are used, at least 55 cells of battery will be required. Moreover, when the battery is almost discharged, each cell will give only about 1.8 volts, so that if the lamps are burned at full brilliancy when the battery is almost discharged a few extra cells will be required, making perhaps 60 in all. Of course, the number of cells required may be decreased by using lower voltage lamps, say 25 or 30-volt lamps, but the low-voltage carbon lamps have an even lower efficiency as light producers than the 110-volt size. Hence, even though these lamps enable us to use fewer cells, each cell must be of larger size, if the lamps are to be burned as long as before without recharging the battery.

During the last year there has been put on the market a new type of lamp having a filament made of the rare metal, tungsten. With these lamps a given amount of energy will produce about three times the candlepower that would be produced by an ordinary carbon-filament lamp. Consequently, when using the tungsten lamp for a private plant it will take much smaller storage cells to operate a given number of candlepower of lights than if carbon lamps were used. These new lamps are made and are on the market in 25 to 30-volt sizes. They give 20 candlepower and require only about 25 watts. These lamps will make possible the cheapest kind of a plant.

In tracing through the design of a private electric plant of sufficient size to light a country home properly with 25-volt tungsten lamps there will be given an example of a lighting scheme for a medium-sized private residence, in which attention is paid to the proper selection and location of fixtures and shades.

Arrangement of the Lights

It is a fundamental principle of good artificial illumination to keep the illumination of objects as strong as is required for the uses to which they are put, and to keep the illumination of objects as the lights as low as possible. The eye endeavors to receive always a constant amount of light by contracting or dilating as the light is intense or dim. When the light reflected to the eye from any object is intense, the pupil contracts so as to shut out a large part of the rays. When light of only low intensity reaches the eye from any body, the pupil opens wide so as to admit sufficient light to enable the eye to see the object distinctly.

Contrary to the popular idea, the selection of shades and globes should not be made primarily with regard to their decorative qualities. Properly designed and constructed shades and globes are made either to send the light in some desired direction, to diffuse the light, i. e., decrease its intensity, or to combine the two purposes. A person selecting a shade for a light should then bear in mind the location of the light, where the strongest illumination is desired, and whether the light needs to be diffused. A shade or globe should then be selected that will fulfill the required conditions. Many manufacturers will furnish diagrams showing how each particular shade or globe made by them diffuses and distributes the light.

Opaque metal and silvered glass reflectors are very satisfactory for deflecting the light in any desired direction, but they give no diffusion and always make a room look dark and cold on account of furnishing no light to the ceiling. They also give too great contrasts between intense light and darkness so that the pupil of the eye, as one looks from place to place about the room, must continually contract and dilate so that it is soon fatigued.

Since the sole object of an electric-light plant is to provide illumination for the house, it is common sense to plan a good lighting scheme and then build a plant and install wiring in accordance with this scheme. This statement is called forth by the fact that the opposite course is usually pursued. The wiring is usually installed and the outlets for the lighting fixtures placed in a sort of a hap-hazard way at any convenient spot.

We will assume as a house for which we are going to design an electric-lighting system, a country home having, on the first floor, a living room, a dining room, a kitchen, a front and a rear hall, a bedroom and a large porch in front. On the second floor there are four bedrooms, each provided with a closet, a bathroom and a hall. In the cellar there is a large furnace room, a fuel room, a laundry, a vegetable room and a store room. Plans of the two floors and the basement are shown in Figs. 1, 2 and 3.

Living Room.—Since this is the room in which most of the leisure time of the family is spent it should be well lighted. First of all there must be a light for reading purposes. The ordinary table electric reading lamp would be very satisfactory for one or possibly two persons to read by if a general illumination for the room were taken care of by other lamps. In the ordinary farm home, however, usually more than one or two persons wish to read at the same time. Moreover, the lamp that furnishes light for reading is usually required to furnish a general illumination for the room. This a table lamp will not do. Accordingly, a three-light fixture should be provided.

In this fixture the middle socket points directly downward and is equipped with a prismatic glass reflector. This will concentrate the light under the chandelier for reading purposes and at the same time permit sufficient light to pass through to give a moderate illumination of the walls and ceiling. Thus, the single reading lamp would be sufficient for ordinary occasions. On special occasions, however, when a general illumination rather than a concentrated light for reading is desired the middle lamp is turned out and the two outside lamps are used. These two lamps are provided with prismatic reflecting globes. Since the reflecting globe will prevent the dazzling direct rays from the filament from reaching the eyes of a person in the room the unfrosted lamps may be used. The middle lamp, however, may be seen from positions close under the chandelier. Hence a frosted lamp should be used here. The fixture should be hung so that the lamps are about 6½ feet from the floor.

Dining Room.—A dining room requires a strong illumination over the table and a soft pleasing light over the walls and ceiling. This can be obtained for the room we are considering by two lamps placed in prismatic bowl reflectors hung at a height of six feet from the floor. These reflectors will distribute the light well to the edges of the table, while the ceiling and walls will be sufficiently lighted to make the room seem cheerful but not brilliant. Frosted tip lamps should be used.

Front Hall.—A single unfrosted lamp will amply light the hall. It should be hung about eight feet from the floor so as to throw the strongest illumination toward the door and the foot of the stairs.

Kitchen.—The kitchen holds such an important place in the life of the housewife that it should be well illuminated. It can be adequately lighted by a single lamp in a pendant fixture in the middle of the room. This should be provided with an opal bell reflector. The fixture is hung high so as to be out of the direct line of vision of a person in the room. To provide a more concentrated light over the stove and table where it is most needed there is an adjustable bracket fixture with an opal bell reflector and a frosted tip lamp. This should be placed about six feet high and as nearly as possible between the stove and table. The lamp will be turned on only when needed and the light directed where desired by adjusting the bracket.

Front Porch.—One lamp placed inside of a prismatic reflecting ball is used for lighting the porch. This is placed in front of the door and directly on the ceiling. The upper fluted portion of the ball throws the light downward where it is needed. The lower portion is frosted in order to soften the glare of the filament.

Cellar.—The lights in the cellar are equipped with the flat enameled metal reflectors. These are placed on the ceiling so as to distribute the light well over the walls and floor.

Bedrooms.—For each bedroom a bracket fixture carrying one light in an opal bell reflector is provided. This is placed high enough so that the dresser can be placed directly beneath it, thus fur-

1. An abstract of a bulletin issued by the University of Illinois. The author is first assistant of the Department of Electrical Engineering, Engineering Experiment Station, University of Illinois, Urbana.

nishing a good light by which to dress. This will also provide a sufficient general illumination if the lamp is inclined about 45 degrees from the horizontal. The lamp should be frosted. An eight-candlepower carbon lamp is placed in three of the closets. These are simple drop-lights suspended about 6½ feet from the floor. No extra length of lamp cord should be provided, otherwise the lamp may be hung upon a hook in contact with some clothing. Then if the lamp is accidentally left lighted a fire is almost sure to occur.

Hall and Bathroom.—Simple, single-light pendant fixtures are provided for the second floor hall and

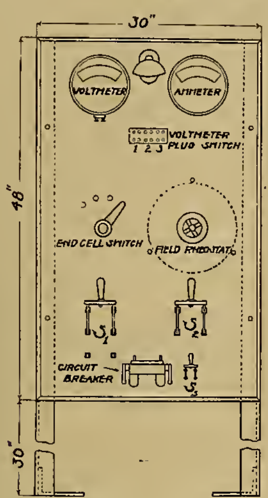


FIG. 4. FRONT ELEVATION OF SWITCHBOARD

the bathroom. These are equipped with opal bell reflectors and are hung about 7½ feet from the floor. The lamps should be frosted.

Design of Plant

Now that we have decided upon the number of lights in each room the next step in the design of our lighting system is to estimate the hours during the day that the lights in each room will be lighted. This will give us an idea of how large our storage battery will have to be to operate the lamps. Of course, the size of the battery will also depend upon how often it is convenient to charge it. Let us assume that we wish our battery to be of sufficient capacity to operate the lights on one charge the entire day when there is the maximum amount of light used. This will be in the winter when the nights are long and when there is some special occasion that keeps the family up later than usual. We will make out a probable lighting schedule for this day. The schedule is given below. In the column to the right are given the lamp-hours per day. The lamp-hours per day for each room are the number of lights in that room multiplied by the number of hours during the day that they are lighted.

Dining Room: Two lights, on during breakfast and supper,
5:00-6:30 a. m.
5:30-7:00 p. m. } 6 lamp-hours

Living Room: Three lights, on only after supper.
7:00-10:30 p. m. .... 10½ lamp-hours

Kitchen: Two lights, on while preparing meals and washing dishes, morning and evening.
5:00-7:30 a. m.
5:00-7:30 p. m. } 10 lamp-hours

Front Hall: One light.
8:00-10:30 p. m. .... 2½ lamp-hours

Front Porch: One light.
7:30-9:00 p. m. .... 1½ lamp-hours

Rear Hall: One light.
5:00-6:00 a. m.
6:00-7:30 p. m. } 2½ lamp-hours

Bedrooms: Two lights.
5:00-5:30 a. m.
9:00-9:30 p. m.
One light.
10:30-11:00 p. m. } 2½ lamp-hours

35½ lamp-hours

This gives a total of 35½ lamp-hours. The lamps that we have chosen will allow about one ampere of current to flow through the filament when the pressure of 25 volts is applied. To produce continually a pressure of at least 25 volts 15 storage cells are required. The nearest commercial size of battery to 36 ampere-hours is the 40-ampere-hour battery. Since ours is a 40-ampere-hour battery its normal charging rate is 40 divided by 8, or 5 amperes. When there is plenty of time for charging it is best to charge the battery at the five-ampere rate. However, if time is lacking, it may be charged in a shorter time with a current of seven, eight or even nine amperes. This capacity of storage battery will require charging only once per day when there is the heaviest probable load. However, there will not ordinarily be as many lamps burning so many hours of the day, hence the battery will usually not require charging more than once in two days, even in winter. In the summer when the days are long and few lamps are necessary, one charge would be sufficient for a week or more.

Now that the battery is selected, we must decide upon the dynamo with which to charge it. Each cell of battery when fully charged will give a pressure of about 2.6 volts, so that the entire 15 cells will give a pressure of 39 volts. Our dynamo should be able to generate about 42 or 43 volts, and a 45-volt machine is a regular commercial size. When charging the battery in a short space of time, eight or nine amperes may be used, so the current delivered by the dynamo must be at least this amount. Since the dynamo we need must give at least nine amperes of current at 45 volts pressure, it must produce 9 times 45, or 405 watts. The nearest commercial size to 405 watts is the one-half kilowatt, or 500-watt size.

Since gasoline engines are usually rated rather high, and often on account of some lack of adjustment they do not give their full number of horsepower, it is well to get an engine considerably larger than the size calculated. For the one-half-kilowatt dynamo we should have a two-horsepower engine.

A switchboard shown in Fig. 4 and apparatus, connected as shown in diagram Fig. 5, with which to control the dynamo and storage battery are next to be selected. An adjustable resistance, called a rheostat, is supplied with the dynamo. There must be an ammeter to measure the current that is being supplied the battery when charging; a voltmeter to measure the pressure produced by the machine, also that produced by the battery, and the voltage supplied the lamps. There should also be a circuit-breaker. As soon as for any reason the dynamo stops generating, the circuit-breaker automatically opens the circuit and thus prevents current flowing from the battery to the dynamo.

As has been noted before, the storage battery when almost discharged gives only about 1.8 volts per cell, so that to produce the 25 volts necessary to light the lamps to full brilliancy the entire 15 cells are required. However, when the cells have been fully charged and the charging current is stopped they give about 2.2 volts per cell, so that to light the lamps, all of the cells are not required. Hence a method should be provided to increase gradually the number of cells of battery that are being used, as the battery becomes more and more discharged. This will enable us to keep practically constant voltage supplied the lamps so that they will burn at almost their full brilliancy until the battery is discharged. For this purpose we provide an end-cell switch.

To obtain the voltage at three different places with the one voltmeter a plug switch is provided having three double pairs of holes or jacks. To the upper pair of each one of these double pairs of jacks are connected the leads from the voltmeter. To the lower pair of the first double pair are brought leads from the terminals of the dynamo; to the second, leads from the terminals of the battery; and to the third, leads from the line leading

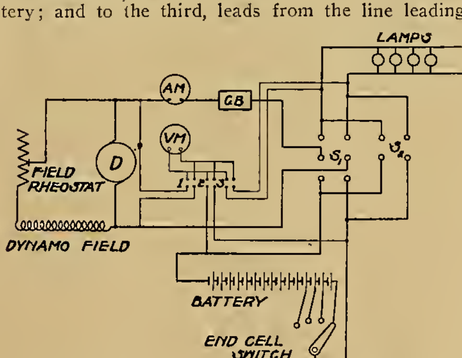


FIG. 5. DIAGRAM OF WIRING CONNECTIONS

to the lamps. By means of a four-point plug any one of the three pairs of leads can be switched on the voltmeter.

Two switches are provided—one double-throw switch by which we can throw the dynamo on to the battery for charging, or by throwing it the other way the lights can be operated directly from the generator. To operate the lamps directly from the dynamo the voltage must be reduced to about 26 or 27 volts. By leaving this switch open and closing the other switch the dynamo circuit is opened and the battery is operating the lights. Of course, by opening the latter switch also the lights are all turned off.

Ordinarily a plant of this sort would be housed in a building large enough to accommodate all of the machinery of the farm that could be operated by the gasoline engine. Such a building would usually not be fireproof, so to decrease the fire hazard the gasoline tank should be buried at some distance from the building and the supply pumped to the engine as needed. Where space is limited and where compactness is desired, as would be the case if the plant were used to light a house in town, a fireproof building would be advisable. Such a building could be built of brick or concrete and should contain a separate compartment for the gasoline tank. The light plant could then be placed near other buildings without danger of fire. If the storage battery were placed in the basement of the house, as may be done, a 10 by 16-foot building would be of ample size to accommodate the plant. A suggested layout of the engine room containing the electrical equipment is shown in Fig. 6.

Estimate of Cost of Plant

A good storage battery of the 40-ampere-hour size will cost from $4 to $5 per cell. A quotation of $4.60 per cell was made by one of the best companies. Since 15 cells are required, the total cost of the battery will be approximately $70.

Gasoline engines can be estimated at about $60 per horsepower, the smallest sizes costing perhaps a little more than this. A two-horsepower engine of a good make will cost about $125.

Complete switchboards vary in cost according to the material of the board, i. e., whether of slate or marble and according to the grade of the instru-

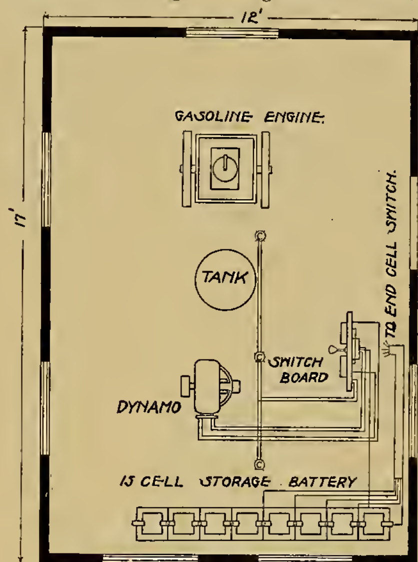


FIG. 6. LAYOUT OF ENGINE AND ELECTRICAL EQUIPMENT

ments and switches furnished. A first-class marble switchboard equipped with good instruments will cost approximately $100.

A one-half-kilowatt dynamo, shunt wound, 45 volts, of a first-class make, can be had for $65.

Seventeen tungsten lamps will be required, each costing $1, making a total of $17.

Fourteen eight-candlepower, 25-volt carbon lamps will cost about $3.

1,000 feet No. 14 wire	$12.00
550 feet No. 8 wire	25.00
Cabinet for basement	2.85
Cabinet for first floor	5.00
Cabinet for second floor	2.85
Porcelain cleats and tubes	2.00
18 snap switches	7.20
Labor, 2 men, 8 days, at $3	48.00

Fixtures

Living Room—One three-light pendant fixture fitted with one Holophane reflector and two stalactites	7.00
Dining Room—Two-light fixtures with Holophane prismatic bowl reflectors	7.00
Front Hall—Single-light fixture fitted with Holophane stalactite	4.00
Kitchen—Single-light fixture fitted with opal bell reflector	2.00
One adjustable bracket fixture	2.00
Veranda—Prismatic reflecting ball in ceiling fixture	2.00
Cellar—Cleat receptacles (five required)	1.25
Bedrooms—Single-light bracket fixture with opal bell reflector (five required)	6.25
Bathroom—Single-light fixture with opal bell reflector	2.00
Hall, second floor—Single-light fixtures with with opal bell reflector	1.50
Closet and Pantry—Five drop cords and sockets with ceiling rosettes	1.50

This makes a total cost of a little over $525 for the entire outfit and for its installation. Allowing for incidentals and for expenses unprovided for in the estimate the plant will cost not more than $550. If necessary, the cost of several items of the esti-

[*Continued on page 312.*]

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

ILLUMINATING ENGINEERS, following the example of the oculists, continue to point out the danger of extreme intrinsic brightness of sources of artificial illumination. Mr. J. E. Woodwell had a paper on this subject at the recent Philadelphia convention of the Illuminating Engineering Society, and although what he said was not particularly new, the subject is of sufficient importance to justify calling attention to the following paragraph:

"The intrinsic brightness of nearly all of the artificial-light sources being so much higher than that of natural daylight is the principal cause of eye-strain and wear and tear on the visual organs. Even the most successful efforts to secure diffusion in artificial illumination by the so-called indirect method cannot be compared with the diffusion of daylight. From this point of view diffusion is the most important single quality of daylight. Diffusion may be obtained in artificial illumination by enlarging the area or surface of the light source, by shading the source with diffusing globes or screens, or by concealing the source and utilizing the diffuse reflection of the surfaces which receive the direct light."

Mr. Woodwell is of the opinion that in designing illumination from 0.2 to 0.1 candlepower to the inch is none too low for the best practice where artificial sources must be placed in the constant or even occasional field of vision. The alternative is to exclude completely the lighting sources from the actual range of sight. Much depends, of course, on the working conditions; the essential point, in the author's judgment, is to reduce the intrinsic brightness of all sources within the field of vision to not over 0.2 candlepower per square inch of diffusing surface.

THE ELABORATE REPORT on "The Electrification of Railway Terminals," just issued under the auspices of the mayor and committee on local transportation of the City Council of Chicago, is distinctly creditable to all concerned in its preparation. These gentlemen are Mr. Milton J. Foreman, chairman of the local transportation committee; Dr. William A. Evans, commissioner of health; Mr. Paul P. Bird, smoke inspector; Mr. Gilbert E. Ryder, smoke inspection department, and Mr. Herbert H. Evans, mechanical engineer. They have prepared a book of 353 pages, with numerous diagrams, illustrations and plates, considering the electrification of railway terminals "as a cure for the locomotive smoke evil in Chicago, with special consideration of the Illinois Central Railroad." The inquiry is considered under these headings: "The Harm of Smoke," "The Prevention of Smoke in Chicago," "The Railroads as Smoke Producers," "The Possibility of Smokeless Steam Locomotive Traction," "Anthracite Coal and Coke as Remedies," "Electrification as a Remedy, with Special Consideration of the Illinois Central," "The Railroads in Relation to Local Transportation," "Conclusions." There is also an appendix with charts and computations. These titles well indicate the comprehensiveness of the report.

Of the 18 conclusions, 10 may be quoted to show the gist of the committee's findings:

Electric traction would remedy so much of the smoke evil as results from locomotive smoke.

Electric traction is a developed art, the experimental stage being well in the past.

The Illinois Central locomotives do harm.

Electrification of the Illinois Central terminal in its three arms, through passenger, local passenger and freight, is feasible.

The Illinois Central problem does not differ radically from the problems of the other roads entering Chicago.

A proper regard for the conservation of the world's coal supply demands the coal economy of electric traction as compared with that of locomotives.

The air is the common property of the people.

The right of control of the purity of the air by government is superior to the right of control of water in proportion as the purity thereof is more necessary for life and health than is water.

In the reasonable administration of this trusteeship or right, the obligations of government are superior to any rights of property or liberty of any individual or any corporation or government of lesser jurisdiction.

The demand that the Illinois Central electrify its terminals is reasonable, is justified by a proper consideration of all the factors involved, and is a duty devolving upon the local government.

It would appear that no one could gainsay the reasoning of the report. The Western Electrician congratulates the committee and its helpers on the excellence of their work.

TWO-FIFTHS of a cent per kilowatt-hour! Surely that is a notable achievement as a selling price for electric power generated in a steam power station. That is the ultimate rate for current in the remarkable contract between the Commonwealth Edison Company and the Chicago City Railway Company, summarized elsewhere in this issue. To it, however, there is added a "minimum primary charge" of $1.25 per kilowatt per month on the installation capacity, which will bring in to the company from $315,000 to $600,000 a year, according as the standby capacity varies.

The kilowatt-hour rate is less than the actual cost of producing current in most steam electric generating stations. But the Fisk Street station has a most enviable record in low producing cost, and perhaps the 0.4 cent represents the bare cost of producing a kilowatt-hour. In that case the standby charge represents the interest on the investment and the profit. This is mere conjecture, of course, but in whatever light it is viewed the contract is probably the most notable in the history of American central-station practice. It represents an epoch in advanced merchandizing of electricity, and Mr. Insull and his organization will be congratulated on a most noteworthy accomplishment.

ONE OF THE practical papers read at the recent convention of the Illuminating Engineering Society in Philadelphia was by Mr. James R. Strong, the New York electrical contractor, and was entitled "Structural Difficulties in Installation Work." The speaker dwelt on the importance of planning wiring installations and location of outlets so that no changes or few changes need be made after the work is completed. The electrical equipment is as much a part of the building as the plumbing or heating apparatus and should be as permanent. Nevertheless in designing office buildings the fact must be borne in mind that different tenants will have different light requirements. By a little forethought and by providing a larger number of outlets this situation can be met in the original installation. The initial equipment, not only in commercial buildings but in residences, should be such as to cover any probable requirement. In general, there should be more elasticity to the "layout" of conduits and wires than is now generally the case.

In conclusion Mr. Strong had something to say about specifications. In his opinion it is most desirable that the specification be made as simple and concise as possible, and that specialties should be avoided, such as the special stranding of wire different from the standard; extra heavy carrying capacity for switchboards and panel boards; extra spacing between conductors of different polarities; special outlet boxes different from the standard; the specifying of a particular appliance when several of equal excellence are on the market; the clause (which Mr. Strong thinks unfair) requiring the contractor to make any alteration of outlets requested without additional charge, and various other items along the same line. "It is for the benefit of all concerned," says the writer, "that electrical work be as near the standard as possible, and it will probably be conceded that the standards established by the underwriters are sufficient to insure safe and good construction. Standardization means economy and will unquestionably tend to minimize the cost of construction."

Mr. Strong's paper contains suggestions of value and relates to a subject not often discussed before technical societies. The conscientious electrical contractor—and there are such—takes a pride in his work and his reputation; he wants to do a good job at the outset; and his recommendations to that end are worthy of attention.

STREET-RAILWAY CONVENTIONS AT ATLANTIC CITY

With a total registered attendance of between three and four thousand, the conventions held last week at Atlantic City by the American Street and Interurban Railway Association and its subsidiary associations will take a proud place in the record of very large street-railway conventions of recent years. There were five distinct conventions, and the holding of them began on Monday, October 12th, and came to an end on Friday, October 16th. The schedule was as follows:

American Street and Interurban Railway Association, Greek Temple, Convention Pier, Tuesday afternoon, Wednesday afternoon, Thursday afternoon.

American Street and Interurban Railway Accountants' Association, Chalfonte Hotel and Aquarium Court Hall, Convention Pier, Wednesday morning, Thursday morning, Friday morning.

American Street and Interurban Railway Engineering Association, Aquarium Court Hall and Greek Temple, Tuesday afternoon, Wednesday morning and afternoon, Friday morning and afternoon.

American Street and Interurban Railway Claim Agents' Association, Traymore Hotel, Monday afternoon, Tuesday morning and afternoon, Wednesday morning.

American Street and Interurban Railway Transportation and Traffic Association, Greek Temple, Monday afternoon, Tuesday morning, Wednesday morning, Thursday morning.

It will be seen that the meetings made a strenuous week. In addition there was a fine display of appropriate exhibits on Young's Million Dollar Pier, in charge of the American Street and Interurban Railway Manufacturers' Association, the sixth of the cluster of organizations. There were over 200 exhibits, and the display was elaborate and instructive.

Entertainment features included a reception on Tuesday evening, theater parties, amateur vaudeville, dancing parties, sight-seeing excursions and the like.

Mr. James F. Shaw, president of the Boston and Worcester Electric companies, Boston, was elected president of the parent association, having served as first vice-president.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION

President C. G. Goodrich of Minneapolis was unable to attend the convention, and Vice-president Shaw presided. At the opening session of this association on Tuesday afternoon Mr. B. V. Swenson of New York, the secretary and treasurer, presented his report. He said that seven confidential bulletins have been issued to members since January 15, 1908, and five more are expected before the close of the year. The organization of the new Transportation and Traffic Association was related. The total number of active members in good standing is 262 and of associate members 249, a total of 511. The receipts of the year were $32,969 and the expenditures $29,604, leaving a balance on hand on October 1st of $3,365.

Mr. Shaw then read from manuscript the annual address of President Goodrich, which, among other topics, contained suggestions as to the future policy of the association in appointing separate times and places for holding the annual conventions of some of the affiliated associations. This suggestion was discussed by the members present and at a later session it was resolved that the recommendations of the president relating to a separation of the meetings of the parent association and its affiliated associations be referred to a committee "to consist of the incoming president and seven other persons to be appointed by him, at least two of whom shall be past presidents, which committee shall report its conclusions, together with any other recommendations, as to the advisability of a separation of the meetings of this association organization and procedure of the associations at the next annual meeting."

After various items of routine business had been discussed the final business of the session was the report of the committee on state and federal regulations, of which General G. H. Harries of Washington is chairman. This report was presented in person by General Harries.

Wednesday's session was opened by the report of the committee on education, presented by Prof. A. S. Richey in the absence of the chairman, Prof. H. H. Norris of Cornell. The conclusions of this report were as follows:

(1) The examples of the very recent and successful progress being made by the railway and lighting industries in the training of employes indicates the importance of such work.

(2) This association is the natural center of information and interest regarding the development of employes.

(3) Some form of cadet or apprentice plan seems necessary to the best development of employes, but the plan must be adapted to local conditions.

(4) The question and answer system of the Trustees' Gas Educational Fund might prove useful to the members of this association if similarly adapted.

Prof. D. C. Jackson of the Massachusetts Institute of Technology sent a written contribution to the discussion. He pointed out that apprenticeship systems could not take the place of regular engineering courses. Nevertheless, it seems likely that an extension of this cadet system among the various electric-railway companies will lead to an ultimate enlargement of the body of competent and able engineering and executive officers which the companies have to draw from. To the development of the cadet work the engineering schools ought to offer every assistance. To the development of apprenticeship systems the engineering schools can only offer advice and encouragement, because such arrangements belong to the production of skilled mechanics and operatives and are outside of their normal and appropriate sphere of education leading to engineering in a broader and deeper sense.

C. H. Hile of the Boston Elevated Railway Company gave it as his opinion that through a cooperation of the railway companies with the technical schools and industrial schools the former could expect much help. He referred to the practice on the Boston system, which is to put a boy in one of the various departments of the company for a certain number of months to learn the business, a specified time in one place and a specified time in another. The boys keep shifting around, but in the meantime are progressing and gradually advanced to higher positions, and eventually are selected to fill more or less important vacancies in the company's force.

Howard F. Grant, Seattle, described the system employed by Stone & Webster, who established some years ago what is called the "student course." Stone & Webster, however, do not go into the matter of training shop men, or into any system of shop apprentices. They take from the technical schools, through careful selection, aided by the professors of the classes, young men who have shown proficiency. Beginning at $60 a month in the Boston office, the young men are sent to the various Stone & Webster properties in different capacities.

W. Caryl Ely delivered an address on the subject, "How Can the American Street and Interurban Railway Association and Its Affiliated Associations Be Made of the Greatest Value to the Member Companies?" Mr. Ely said that the work which the affiliated associations had to do was of great magnitude, and he believed that the different classes of work should be subdivided and committed to the care of various committees so that ample time could in that way be had to provide for the proper investigation of any subject which was pending before the associations.

A communication from the J. G. Brill Company was read, in which that company offered a prize to students in the technical schools of the country for the best thesis on city and interurban cars, and requested the appointment of a judge to act in conjunction with S. M. Curwen and H. W. Blake in awarding the prize for these papers. The association voted to authorize the incoming president to make this appointment.

At Thursday's session the first business was the report of the committee on insurance, of which H. J. Davies of Cleveland is chairman. Mr. Davies was not present at the meeting, but sent a letter describing the work which had been done by the committee during the year.

E. G. Connette of Worcester, chairman of the committee on welfare of employes, then presented the report of that committee. It was recommended that rest rooms and sanitary conveniences be provided at car houses and terminals. In conclusion, after considering such matters as mutual benefit associations, the club spirit, the merit system and discipline, the committee said: "Where a company shows interest in the welfare of its men there will be found a better class of employes, a closer observance of rules and regulations and a spirit of co-operation in matters pertaining to the company's interests, resulting in more efficient service to the public, which is an important factor in securing and fostering its good will—one of the company's most valuable assets."

The report was discussed by C. D. Emmons of Fort Wayne, W. G. Ross of Montreal, John R. Graham of Bangor, Me., C. H. Hile of Boston and others.

Vice-president Shaw then introduced George W. Bishop of the Board of Railroad Commissioners of Massachusetts. Mr. Bishop said that he appreciated the privilege of being present at the meeting, and that he had come representing the Board of Railroad Commissioners of the Commonwealth of Massachusetts to get such information as might be possible relative to the best construction, equipment and method of operation of the electric railways. He considered the conventions and exhibition to afford an unusual opportunity for collecting such information.

Officers of the American Street and Interurban Railway Association were elected as follows on the recommendation of a committee of which Albion E. Lang of Toledo was chairman:

President—James F. Shaw, Boston, Mass.

First vice-president—Arthur W. Brady, Anderson, Ind.

Second vice-president—Thomas N. McCarter, Newark, N. J.

Third vice-president—General George H. Harries, Washington, D. C.

Fourth vice-president—Charles N. Black, San Francisco, Cal.

Vice-president Brady presided while President Shaw returned thanks for his election.

The committee on resolutions, of which W. E. Harrington was chairman, presented a report thanking the Manufacturers' Association for the exhibits, the Atlantic City people, the technical and daily press, officers and committees of the association and President Goodrich.

Resolutions expressing regret at the deaths of C. Densmore Wyman and John A. Brill were also adopted, and the association adjourned.

AMERICAN STREET AND INTERURBAN RAILWAY ACCOUNTANTS' ASSOCIATION

The twelfth annual meeting of the Accountants' Association was called to order at the Chalfonte Hotel on the morning of Wednesday, October 14th, by R. N. Wallis, the acting president. After approval of the records of the last meeting, Mr. Wallis read the annual address of the president. Acting Secretary H. E. Weeks read the report of the exeecutive committee and also that of the treasurer, showing expenditures during the year of $1,794.66.

F. W. Sweney, special examiner of the Interstate Commerce Commission, was then introduced by Mr. Wallis. He said the commission had issued three classifications, which will become effective on January 1st. If there are any points in which the classifications are not clear, they can be developed by suggestions or questions , addressed to the Commission at Washington.

The paper on the "Organization of the Accounting Department of an Electric Railway and Light Company" was then read by A. R. Patterson of Stone & Webster, Boston, Mass. In the discussion P. V. Burington of Columbus said he had about 10,000 customers, and it took a force of about 12, including the cashier, to take care of that business. H. T. Bunn of Knoxville said that the author's organization was similar to that of his company, with the exception that he had about 3,000 customers, with one cashier and one meter reader.

H. M. Edwards, representing the National Electric Light Association and the New York Edison Company, was introduced. He said that in rendering customers' accounts there is a greater lack of uniformity than in almost any other branch of the business. In the New York Edison Company the system was elaborate; it must be, because it had now 80,000 customers connected. The company uses a bound ledger. There is one weak point in the system, and, in fact, in all electric systems. The company lacks a slot meter. The Consolidated Gas Company of New York city has, Mr. Edwards thought, between 40,000 and 50,000 slot meters. The New York Edison Company has 5,000 weekly customers. Of these 5,000 weekly customers, 40 per cent. wait for the cut-off man. Mr. Edwards added that of all the money taken in by his company, 65 per cent. was received through the mails, 25 per cent. through collectors, and 10 per cent. paid over the counter.

At Thursday's session President F. G. Simmons of the Engineering Association and E. C. Carpenter of the Claim Agents' Association spoke briefly.

The paper on "Interline Accounting of Interurban Railways," by William H. Forse, Jr., secretary and treasurer, Indiana Union Traction Company, was then read. There was an extended discussion.

P. S. Young, comptroller of the Public Service Railway, Newark, N. J., then presented a paper on "Accounting Methods of a Holding Company."

W. F. Ham of the Washington (D. C.) Railway and Electric Company presented the report of the committee on standard classification of accounts and form of report. In discussing the report of the committee, after its adoption, President Wallis said the association would be glad to hear again from F. W. Sweney of the Interstate Commerce Commission. Mr. Sweney said the plan had been with the other carriers for which classifications had been prepared, especially the steam carriers, to develop the classifications through correspondence and rulings of the commission. The steam carriers had a committee of 25, which represented the steam roads of the country, and all matters which were called to the attention of the commission for a ruling were eventually referred to this committee, and all of the rulings, which were issued on July 1st in the form of a bulletin, received the approval of that committee.

President Wallis then introduced A. F. Weber, statistician for the Public Service Commission for the First District of New York, who addressed the meeting briefly.

On Friday the paper of Albert B. Bierck of Long Island City on "The Effect of Electrification on the Accounting Methods of a Steam Railway" was read by Acting Secretary Weeks in the absence of the author.

Frank R. Henry, who resigned as president of the association during the last year because of his resignation from the United Railways Company of St. Louis, to engage in other business, was elected an honorary member of the association.

President Wallis appointed a committee on interline accounts, as follows: W. H. Forse, Jr. (Indiana Union Traction Company), chairman; Irwin Fullerton (Detroit United Railway), C. L. Wight (Interburban Railway), Des Moines, Iowa.

R. N. Wallis, treasurer, Fitchburg (Mass.) and Leominster Street Railway, was elected president for the ensuing year. H. E. Weeks, secretary and treasurer, Tri-City Railway, Davenport, Iowa, was elected secretary.

AMERICAN STREET AND INTERURBAN RAILWAY ENGINEERING ASSOCIATION

President Fred G. Simmons called the sixth annual convention of the American Street and Interurban Railway Engineering Association to order in the Aquarium Court Hall, on Tuesday afternoon. The first order of business was the reading of the annual address of the president, extracts from which follow:

"The idea of carrying on the work of the association by means of standing committees, which was so ably put before you by our past-president, Mr. Adams, in his addresses to the conventions at Columbus and here in Atlantic City last year, has been put into effect to such an extent that all the work presented by the association this year, except only the Question Box, is presented through the medium of standing committees, and it might be said that for years past the secretary has been a committee of one appointed to handle the Question Box.

"We have at the present time nine standing committees covering practically the entire field, but it will undoubtedly be found desirable to add to, change and supplement these committees as we progress further and get more deeply into this important work.

"The reports submitted this year cover a broad field and represent much effort and much sacrifice on the part of the gentlemen responsbile for them. Their value is beyond dispute, and as the committees continue from year to year, methods of standard practice should be developed that, backed with the approval of our association and the main association, will eventually save to the street and interurban railway interests the gigantic sums now being expended in experimenting and through the lack of unification now existing in the business, in a manner and upon the same lines that great savings were and are being effected by the steam-railway interests.

"It is advisable, in my opinion, that our standing committees should endeavor to make definite recommendations as their work progresses in manner similar to the work already accomplished by our standardization committee, for all these committees should be in effect standardization committees."

The report of the executive committee was then presented. Its recommendations related mainly to the standing committees. The number of committees this year was rather large and much of their work overlapped. It was therefore thought advisable to divide the work of the association into four lines, into which it seemed naturally divisible, which were "Equipment," "Way Matters," "Power Generation" and "Power Distribution." These four committees should be composed of six members engaged in that line of work, and they should take up and whip into shape all the preliminary matter looking to a recommendation for standard practice, their reports to be presented to the convention at the end of the year. Prior to that time, however, their recommendations for standard practice would be submitted to a committee on standards, to be composed of the chairman of each of the other four committees, four other gentlemen from the particular lines of work involved, and a fifth member at large. The object of these committee changes was that all suggestions for standard practice could be assembled and presented as definite recommendations, and discussed in a manner that would simplify the committee work and also make it more effective.

The report of the executive committee was accepted, as was the annual report of the secretary and treasurer.

Maintenance and Inspection of Electrical Equipment

The first technical subject considered by the association and which took up the remainder of the afternoon session was the report of the committee on maintenance and inspection of electrical equipment. The committee consisted of L. L. Smith of Highwood, Ill., chairman; E. T. Munger of Chicago, C. C. Long of Reading, Pa., L. W Jacques of Fort Wayne, Ind., and F. P. Maize of Rochester, N. Y. The report was very long. The general subject was divided under various sub-heads and the list given below of the detail subjects, considered separately, will serve as an outline of the scope of the committee's report: Carbon brushes for railway motors; insulating materials for railway repair-shop use; recommendations of committee of last year, extent to which they have been approved and followed; gear and pinion specifications; lubrication; gear and pinion lubrication; rules for lubrication for the guidance of car-house employes; armature and axle liners; trolley wheels; air-compressor maintenance; air-compressor inspection; time vs. mileage basis; car-house organization; practical rules for the inspection of electrical equipment for the guidance of car-house employes; home-made tools and devices.

In its conclusion, the committee was led to believe, through evidence of data sheets and otherwise, that in a number of cases its recommendations of last year have been acted upon by member companies with beneficial results. It was especially gratifying to note the increased interest toward its work which has been manifested by the member companies. Last year 34 companies responded by filling out and sending in data sheets, while this year data have been received from no less than 72 member companies, and in nearly all cases, this year, the data sheets have been filled out in an admirably complete and pains-taking manner.

E. W. Olds of Milwaukee discussed a number of the committee's suggestions, particularly as to gears, pinions and lubrication. In regard to rules for lubrication for the guidance of car-house employes he thought that this was a matter for which it was impossible to lay down a hard and fast rule. There are different conditions that have to be met as, for instance, on elevated roads contrasted with lines on dusty and dirty streets that are not sprinkled. In regard to the size of trolley wheels, he thought that the committee's recommendation of 4½ inches diameter for city roads and six inches for interurbans was a little too small.

Paul Winsor narrated his successful experience in impregnating coils, about 500 of which were treated. Foremen's meetings he found to be highly valuable. For three or four years his company has had them, and they are chiefly a discussion of the troubles of the previous month. Largely as the result of these foremen's meetings, they have reduced delays in service, so that today these are less than one-half what they were one year ago.

H. H. Adams of New York also touched upon the question of foremen's meetings. It has been his practice in the past not only to take up equipment troubles, but to go further, and to present to the foremen interesting subjects. In fact, he has presented papers that have been read before this association. By taking up items of that character and bringing in a small amount of the routine work that had to be brought up he found that an interest was created among the foremen that could not be got in any other way. In regard to trolley wheels, he found as the result of extensive tests in Baltimore that the average life was about 8,000 to 10,000 miles for the four-inch wheels, and the five-inch wheels ran from 20,000 to 25,000 miles, showing that there is considerable advantage in the comparatively large, light trolley wheel.

J. F. Doyle of New York, speaking on the subject of carbon bruches, said, "During the last year we have had about three billion miles of work with a certain type of carbon. It is worth about six times more than the ordinary carbon. That type of carbon has reduced troubles on the Manhattan elevated about 85 per cent., and about 96 per cent. on the subway. The cost of the carbon runs about 17 3/10. cents per 1,000 car-miles, as compared with the former cost of 44 cents per 1,000 car-miles, so that there is some decided advantage to be obtained."

Mr. Gindre of the Le Valley Carbon Company considered that a good brush should show a fracture of uniform appearance both crosswise and lengthwise and must be free from certifications and shrinkage cracks without the least restriction on the latter point. In speaking of tests, the vibration test recommended he did not believe to correspond to conditions of practice. The resistance test he had always found of great value. This test led him to suggest a more valuable one, inasmuch as he believed it answers more closely to actual practice. This is the contact resistance, or contact drop, test, which would consist in running two brushes of the same grade on a hard-drawn copper ring, a given specific current entering through one brush and going out through another at well-defined speeds and ni measuring the total contact drop of these brushes, whatever the difference between the positive and the negative one might be. Besides the contact resistance, a very important feature of every carbon brush is its friction coefficient. It would not be a difficult matter to modify the apparatus above described in order to include the friction-loss measurement. As to the abrasion test, he thought that the rational method would consist in running different brushes on a soft material, the wear of which, measured by the decrease in weight, would be proportional to the abrasive coefficient. A realization of the method would, for instance, consist of a wheel with a steel band shrunk thereon and on which a deposit of soft electrolytic copper had been made.

J. S. Speer of the Speer Carbon Company thanked the engineers for getting up standard specifications for carbon brushes. As a manufacturer of motor brushes for the last 18 years he had found it no little task to meet a great many different specifications. The ones to be adopted he thought good.

E. T. Munger of the committee said that to meet some objections made to the vibratory test, the committee had agreed to make a change in the drop from one-eighth inch to one-sixteenth inch. Also that the diameter of the wheel be increased to 9¼ inches.

H. H. Adams defended the committee's aims in making the specifications on carbon brushes severe. The tests proposed were much more severe than conditions to be met in actual practice, because it was aimed to get quick results. Brushes tested under standard conditions, even though these be severe, ought to give a fair indication of their relative serviceability and life on road conditions.

Mr. Brady of the National Carbon Company thought that most of the tests advocated will be found to be impossible for master mechanics or men in the barns to make. Most of them he regarded as laboratory tests, which it is hard enough to make and make accurately. Carbon, being of a cellular structure, has only a few points of contact, unless extreme care is taken in working the brush down to a true surface. That is one of the points giving a lot of trouble, particularly on the slip-ring test. A brush with a high contact resistance will glow more quickly than a brush with a low contact resistance. A brush with a high contact resistance is a good brush to have in some cases, while one with a low contact resistance is good in other cases. With the abrasion test, or any of the other tests, it is a question of the fit of the brush. Extreme care must be taken to avoid trouble in the slip-ring test. Disregard of a perfect fit may cause blame to be thrown on the quality of the brush. That is one great objection to having any test made by men outside of a laboratory. It does not necessarily mean that a brush that would give 100,000 revolutions on a vibrator, and 300 amperes on a slip ring will work satisfactorily on all motors. It may work and may not.

N. W. Storer told of struggling with the carbon-brush question for the last 15 years. One thing that impressed him more and more frequently was the extreme difficulty of getting the manufacturers of carbon brushes to duplicate samples which they have submitted. He hoped that the specifications which had been proposed will be the starting point for getting brushes which we can rely upon just as much as we can on any other part of our equipment. The brush is one of the most important parts of a railway motor, and it is absolutely necessary to get one which will hold together and will operate with satisfaction on a commutator without any special care. The arrival of the interpolar motor now makes that all the more necessary.

Mr. Roberts declared that the brush requirements for the ordinary motor are not the same as for the interpolar motor, and the requirements for either of these motors are not the same as they would be for motor generators, and the requirements for motor generators are not the same as are made for ordinary direct-current generators. It is only necessary now to go to standard manufacturing companies and specify our requirements to have these requirements filled in a satisfactory way. If a standard is made by us in a general way for them, and we insist upon that, we are throwing the onus of any breakdown or any difficulty upon ourselves, but I think if we go to these companies and explain to them the conditions that we desire to use the material under we leave it to them, and you know that they are more than anxious to meet any requirements that you may present to them.

J. F. Doyle of New York, in speaking of gears and pinions, said that for a year that matter had been taken up with the steel manufacturing companies, metallurgists, chemists and engineers of all sorts throughout the country, and they found that special treatment of carbon steel gears increases their strength as much as 100 per cent. He suggested that the standardization committee design a normal form of test to develop the wearing features of different compositions of material and material that has been treated in a specific manner. He also had a good deal of experience and made a considerable study of the subject of carbon steel in axles. A great deal of failure was experienced with axles during the last year, about 50 per cent. of one kind of axles having been found to be more or less cracked. As a result he had something of value to offer to the standardization committee in the way of simple, special treatments that do not materially increase the cost of the product. The special treatment of gearing also adds very slightly to the cost. The increased life will more than offset the increased cost.

Prof. E. E. F. Creighton of Schenectady took up the subject of lightning arresters and stated that during the past two or three years tests have been made on them pretty much the same as those proposed on brushes. For many years lightning arresters had been designed to meet unknown conditions. He called attention to the latest development in lightning arresters or the aluminum arrester. This year a number of them were put out experimentally and have given fairly good success. The arrester in itself has a very high discharge rate, and so far as operation and protection are concerned it has been excellent. Naturally the first year there have been some troubles that could not be forseen, due to the conditions arising in practice. He then discussed the use of lightning arresters on alternating-current transmission lines for railways and for the ordinary direct-current trolley line itself. With slight modifications for these two kinds of service the aluminum arrester adapts itself admirably to both conditions. The different classes of lightning disturbances to be guarded against were described, and with the exception of heavy direct strokes the aluminum arrester was declared to completely fill the bill.

In answer to a number of questions, Professor Creighton declared it was impossible to say definitely just how many lightning arresters should be installed per mile of trolley line on account of the variety of conditions. With freely discharging arresters perhaps two per mile would be sufficient to relieve the ordinary strain. He also described in more detail the phenomena of direct strokes and declared that to guard against them we have to trust to Providence and hope for the best.

After some discussion as to the effect of adopting the committee's report, it was finally declared that the recommendations are to become the expression of the association as to what was best practice, and if quite generally adopted by the different companies they would be taken up by the standardization committee. On motion of Paul Winsor the report was accepted and the recommendations of the 1907 committee after a year's trial were at the same time adopted.

Standardization

The session on Wednesday morning was called to order at 9:30 a. m. The first topic considered was the report of the committee on standardization, consisting of W. H. Evans, chairman, H. A. Benedict, R. C. Taylor, H. H. Adams, M. O'Brien, J. M. Larned, H. W. Blake, C. B. Fairchild, Jr., and L. E. Gould.

The report of this committee was confined to recommendations on the following subjects:

(a) Standard height of couplers for city and interurban cars.

(b) Standard automatic couplers for interurban cars and radial draft rigging.

(c) Standard height of platforms.

(d) Standard height of car steps.

(e) Standard height of bumpers.

The committee recognized that the establishment of standard heights was a most important matter and that it would not be advisable to proceed without full information in regard to the latest practice and any standards which had been adopted by individual roads throughout the country. A data sheet was consequently sent to all member companies of the association, and the information thus secured was tabulated and considered before deciding upon the recommended standards.

(a) The consideration of the question of a standard height of couplers for interurban cars disclosed the fact that there is no generally accepted practice in this respect at present. The heights vary from that ordinarily used on city cars, say, 20 inches, to somewhat above the standard for steam railroad equipment. The development of the interurban railway business, particularly throughout the Middle West, has demonstrated that it will be most desirable to make the height of couplers for interurban cars the same as that which has served as standard for steam railroads for a long period of years. This will permit the two classes of cars to couple automatically, an important consideration. The committee therefore recommended that the standard height of couplers for interurban cars, from the top of the rail to the center of the coupler, should be 35 inches. This is the standard adopted for all steam railroad passenger cars. For city cars the recommendation was that the standard height of couplers from the top of the rail to the center of the coupler be 20 inches.

(b) There was recommended the adoption as standard for interurban railways of a coupler of a vertical plane type which will have the same contour lines of knuckle and guard arm and will automatically couple with standard steam-railroad couplers. The draft rigging and drawbar supports for these couplers should also be such that, with sudden changes in the grade, the vertical displacement of the couplers with reference to each other will not be su..cient to cause the knuckles to become disengaged. In regard to the length of a radial coupler, taking into consideration the various types of cars at present in service, the committee recommended that the distance from the center of the pocket pin to the pulling face of coupler be 54 inches. This length will apply equally as well for cars in city service. On city cars where the bumper arrangement will permit, a pocket casting should be placed on the top of the bumper, the center of the pocket to be 35 inches above the top of the rail, and the casting to be of ample strength and properly braced, so that by means of a suitable bar city cars can be coupled on a level with the automatic couplers of interurban cars.

(c) The standard height of platforms for interurban cars from the top of rail to the top of platform floor was recommended to be 51 inches and that this height for city cars be 31 inches. These dimensions appear to correspond closely with those generally adopted in the most approved designs of recently built equipment, and accord with the dimensions recommended for couplers, draft riggings, bumpers, car steps and other portions of the car which directly affect the height of platform above the top of the rail.

(d) For heights of car steps the committee suggests the following as recommended practice for interurban cars:

Top of rail to top of tread of first step, 17 inches.

Top of rail to top of tread of second step, 29 inches.

Top of rail to top of tread of third step, 40 inches.

Top of rail to top of platform floor, 51 inches.

Similar recommendations for city cars are as follows:

Top of rail to top of first step, 17 inches.

Top of rail to top of second step, 31 inches.

Height of riser from top of vestibule floor to floor of city car, 10 inches.

(e) The committee recommends that the standard height for bumpers on interurban cars from the top of rail to the top of bumper shall be 51 inches, and the height from top of rail to bottom of bumper shall be 43 inches. On city cars the standard height from the top of rail to the top of bumper shall be 31 inches, and the width of bumper shall be 6 inches.

In opening the discussion J. F. Doyle of New York spoke of his experience with special steel bumpers used on New York subway trains for the purpose of engaging two colliding trains. An accident in the yards in which an eight-car train running at a speed of 35 miles an hour collided with a string of empty cars showed that this bumper effectively prevented the telescoping of the cars that were equipped with it.

E. W. Olds of Milwaukee thought the matter of automatic couplers is one that is really of as much importance as anything the roads have to contend with today. In former collisions had the cars been equipped with this corrugated buffer that Mr. Doyle spoke of there would have been practically no damage to the car or to the people. He strongly commended the report of the committee on the coupler recommendations.

Mr. Doyle explained further how the bumpers in a collision dissipate the force by throwing the cars off sideways. Unless the casting is placed right on the ends of the sills the great force of high speeds will break down ordinary platforms. The construction of the car should permit the interlocking of the sills at their ends. Then it is impossible for the car to telescope. He does not believe it is possible to generate speed that will destroy the alignment of long sills. The force will go sideways or up and then the superstructure is going to break at the point of attachment to the sills, so that in connection with having castings provided in the structure there should be a dampening spring or substance to absorb shock, between the casting and the end of the sills proper to offer a resistance such as is employed in couplers of freight cars.

E. T. Munger believed that for a proposition where there are two cars with a difference in the height of the bumper, the device that the Hudson Tunnel Company in New York has placed on its cars is of considerable value. He thought the bumper proposition is a very important one, even where there are cars of exactly the same height of bumpers, because there is always a tendency for the cars to override on the platforms, and anyone on the platform at the time of collision is in great danger of injury.

M. V. Ayres of Boston called attention to the difference of 20 inches between the heights of bumpers recommended for interurban and city cars. This means that a 20-inch casting on the city car is necessary to reach to the top of the bumper of the interurban car. That casting should be a heavy steel casting with a bracket sticking up 20 inches above the floor timbers, in which it is bolted in the city car, and is going to be a pretty secure thing to strike a heavy blow against. A simple way of securing an interlocking device against telescoping is to use a good channel iron, bending it around the front end of the car from sill to sill with the flanges between, using the channel iron for a wide bumper and the flanges to prevent climbing. The recommendations of the committee are good, but for some conditions such as exist on his line in Massachusetts an interchange of steam and electric cars is out of the question. They had adopted a type of interurban car which is intermediate between the two types recommended by the committee.

J. F. H. Wyse of Ontario read a communication in which he declared that by adopting proper standards, capital and expenditures will be greatly reduced and the cost of repairs infinitely cut down. The subject of standardization was of especial interest to him at the present time, as there is now before the Ontario Railway and Municipal Board an application to lower the steps of city cars. A number of the most prominent physicians have come forward and stated under oath that the condition of high steps on the cars of the city of Toronto was injurious if not dangerous. He therefore advocated going further into the question to secure a lower standard than 17 inches for the first step on the city cars so that a cause would be removed which promises to be a source of great irritation between the civic authorities and the railway companies.

The president read a communication from Dr. Howard A. Kelley, Baltimore, along similar lines. Others discussing this subject were H. W. Blake, H. H. Adams, E. W. Olds, P. Winsor, J. F. Doyle and W. Roberts.

Mr. Winsor moved that the recommendations as to the height of the first step be amended to read "not to exceed 17 inches." Mr. Blake called attention to the fact that the suggestions as to steps were only recommendaions for good practice and not strictly laid out as standards. The amendment was carried and then on motion of W. H. McAloney of Denver the report was accepted as amended.

Power Generation

The next business to come before the convention was the consideration of the report of the committee on power generation. It was presented by G. H. Kelsay, chairman. The other members of the committee were William Roberts, George B. Dusinberre, G. A. Harvey, R. A. Dyer, Jr., and C. F. Bancroft. The report of this committee was very interesting. It dealt with the experiences of the member companies with steam turbines, which was both favorable and unfavorable compared to reciprocating engines. Steam meters and flue-gas analysis were also discussed.

Control Systems

At the afternoon session there was first considered the report of the committee on control. The report of this committee was odd, in that it consisted only of two papers prepared by representatives of manufacturing companies and no original matter prepared by the committee itself. The two papers were "Sprague-General Electric Automatic Control," by F. E. Case, engineer of railway equipment, General Electric Company, and "Railway Motor Control," by William Cooper, engineer, Westinghouse Electric and Manufacturing Company. In the first paper the latest form of the Sprague railway-motor control system with automatic devices to limit the maximum current that can be admitted to the motors was described in detail with the aid of illustrations and curves of current feeding as well as diagrams of connections. The second paper considered the general subject and described the general characteristics of the various systems of control and their relative advantages.

In opening the discussion on this subject Paul Winsor narrated the experiences of the Boston Elevated. Although they had changed the resistance adjustments, they had not been able to get as smooth current feeding as Mr. Case had shown. He questioned whether an acceleration of five miles per hour per second could be attained as Mr. Cooper had inferred. He thoroughly believes in automatic control. Some experimenting had been done with an alarm bell system which warns the motorman as the current becomes excessively high.

J. F. Doyle spoke of tests made on the Interborough system in New York to determine economy in the use of current. It was found that between some motormen there was a difference of from 30 to 35 per cent. in the amount of current used in operating under similar conditions as near as they could be measured. He believed that if controller makers can get up something that will indicate the extent of coasting of trains and the character of the acceleration we ought to be able to reduce fuel expenditure. He moved that the committee on control of maintenance give the subject some consideration. The motion was carried.

E. T. Munger explained how the Metropolitan Elevated in Chicago adjusted its resistances to get smooth acceleration by trying out the cars with an ammeter in circuit with the motors after the car has been overhauled and is about ready to be placed in service. They have for about a year used coasting boards on this road. They are a good thing when the rules are lived up to closely. Mr. Munger believes that automatic acceleration is so much better than anything which a motorman can do that it would justify any extra expenditure necessary.

Mr. Case spoke about dashpot troubles in automatic control. This is probably due to moisture condensing and freezing in dashpots when the car is laid up. A relay has recently been devised that overcomes this.

Mr. Cooper declared that an acceleration such as he advocated was entirely feasible even on the Boston Elevated, because the coefficient of friction of the wheels on the rail will permit that. It will be very difficult to do without a more perfect control, however. In some braking tests made not long ago he got a deceleration of five miles an hour per second without any uncomfortable jolting.

Mr. Winsor discussed the subject of relays for time limit. He believed that perfect acceleration can only be secured by something like a water-rheostat control or by a control with an infinite number of steps.

The president next appointed the nominating committee, as follows: E. T. Munger, chairman; Charles Hewitt, J. M. Larned, M. V. Ayres and W. J. Harvie.

The subject of relay adjustment was further discussed by Messrs. Munger, Harvie and Winsor, after which the committee's report was accepted.

Power Distribution

The report of the committee on power distribution was presented by its chairman, W. J. Harvie. The report considered the subjects of feeders, working conductors, return system and conduit system.

The general opinion was expressed that some kind of fireproof protection is needed on the outside of the lead-cable sheath in manholes. Some roads are using asbestos, saturated with a solution of silicate of soda. A split-tile protection is recommended by one of the large roads. This is undoubtedly a superior protection and is advisable if local conditions permit its use.

For ordinary trolley wire, in view of the heavier equipments which are now being operated, the tendency toward heavier wire is a natural consequence. The committee believes that the so-called "figure eight" wire should not be considered. Regarding a standard height for trolley wire, the committee regards as good practice, and recommends, that the height of trolley wire above top of rail be standardized at 19 feet.

It is the experience of electric-railway companies that both wood and iron poles are subject to excessive deterioration at the ground line. Many companies have begun the practice of using so-called wood preservatives for wood poles, but up to the present time none of these has been able to show definite results. For iron poles there is recommended, without qualification, the use of an iron sleeve shrunk on all iron poles at the ground line.

In spacing of supports for third rails the committee recommends that a spacing of 10 feet be used on all third-rail construction where 30-foot conductor rail is used, and 11 feet where 33-foot conductor rail is used.

None of the companies reporting over-running third-rail type of construction has protection installed throughout, while the under-running type is protected by wood or fiber. The committee feels that in third-rail installation it is best practice, and it recommends, that protection be installed throughout, where clearances permit, irrespective of whether it be for use on surface, subway or elevated work.

The majority of companies reporting show the use of No. 0000 grooved trolley wire for catenary work, which size and shape the committee recommends. For catenary lines the committee recommends the use of the highest strength messenger cable that can be obtained, in order to develop the full advantage of the catenary type of construction. The cable should be double galvanized, and the committee submitted specifications for galvanizing. Porcelain insulators are recommended for the catenary line. The more recent developments in supporting devices for catenary work indicate the use of structural-steel bridges rather than poles, thus deriving the full benefit of this type of construction in the matter of long spans. The opinion of the committee is that a bridge form of construction should receive very careful consideration at the hands of companies contemplating the installation of catenary, before final decision is reached on the type of supports to be used. This is made an especially important consideration in view of the recent experience in high maintenance costs, due to excessive deterioration of wood-pole lines.

Concluding the committee's report was a paper on "Application of the Theory of the Catenary to Electric-railway Work," by R. L. Allen, engineer for the Archbald-Brady Company, Syracuse, N. Y. Mr. Allen's conclusions are as follows:

(a) The use of a light plow-steel messenger cable strung to a small sag. This will allow full advantage of the elasticity of the material.

(b) The hangers themselves should be as light and flexible as is consistent with strength and durability. This will tend to prevent sparking at the points of support.

(c) The hangers should be spaced 20 feet or 30 feet apart to take care of the expansion and contraction.

(d) There is no reason why spans of 300 feet or more cannot be used.

The discussion was opened by R. D. Coombs of the Pennsylvania Railroad. He considered that the general subject of overhead construction particularly as applied to the electrification of first-class lines, has recently become of great importance. The question of feasibility of any type construction is a mere question of factors of safety, if reasonably severe ice and wind loads are provided for in the design. The condition of operative desirability is really the important point at the present, and the one requiring the most study and experiment. No system can be a success which does not practically eliminate sparking and undue wear of the current collector, whether that collector is a trolley wheel or a pantagraph. To obtain this end various designs of catenary construction have been evolved, and it is hoped that certain experiments now under way will give definite information as to the relative advantages of the different types. The successful type must accommodate itself to changes in temperature, and provide a trolley wire on which the collector may run smoothly. From an operating standpoint, the construction should not involve unnecessary supports over the tracks, and long spans are therefore desirable. Spans in excess of 300 feet will be both economical and practicable. Overhead structures should be designed to avoid unnecessary masses of materials over the tracks or in line with signals.

G. W. Palmer, Jr., of the Boston and Northern Railway believed that for several reasons varnished cambric would give better results than the use of paper for insulating low-tension feeder cables. This was especially true where the lead sheaths are subject to electrolysis.

James Heywood of Philadelphia questioned the advisability of using cambric insulation, as he thought it would give no more protection when the sheath is destroyed than saturated paper.

William Roberts took up the subject of a standard height of trolley wire. The committee had recommended 19 feet, but in Ohio, for instance, the state law required 21½ feet. Mr. Harvie defended the committee's recommendation.

The discussion on lead cables was resumed by Secretary Corning and Messrs. Reed, Ayres, Thomas, Winsor, Heywood and Palmer. After further discussion on the height of trolley wires, the report of the committee was accepted, with a vote of thanks.

Car Houses

On Friday the sessions were resumed at 10 a. m. The report of the commitee on car and car-house wiring was submitted by its chairman, G. W. Palmer, Jr. It was rather brief. It was discussed by Messrs. Ayres, Adams, Harvie and Roberts.

The committee on operating and storage carhouse designs presented its report, which was copiously illustrated by plans and elevations, as well as by pictures showing the good and bad points of various constructions. Martin Schreiber discussed the report at length, going into the details of the designs critically. Others taking part in the discussion were Paul Winsor, John Lindall, H. H. Adams and E. W. Olds.

Way Matters

Mr. Schreiber then read the report of the committee on way matters. Appended to this brief report were three papers: "Proposed New System of Street-railway Construction," by C. B. Voynow of the Philadelphia Rapid Transit Company; "The Open Tank Method of Preserving Timber," by Howard F. Weiss of the United States Forest Service; and "Life of Manganese Steel Rail on Curves," by H. M. Steward of the Boston Elevated Railway. The last paper considered the first cost and the cost of maintenance compared with commercial Bessemer rail and was based on service tests on the elevated division of the Boston Elevated Railway. These results were found to be highly satisfactory.

A written discussion of Mr. Voynow's paper was submitted by G. L. Wilson. C. B. Reed, W. J. French, R. C. Cram, President Simmons and Mr. Voynow discussed the subject further.

Mr. Weiss' paper on timber preservation was discussed by G. W. Palmer, Jr., Paul Winsor, F. M. Durbin, E. F. Hartmann, R. C. Cram, G. L. Wilson, C. K. Durbin, M. Schreiber, C. B. Voynow and the author. The paper on manganese steel rails was discussed by Mr. Schreiber.

Maintenance

At the last session, which was held on Friday afternoon, the committee on economical maintenance submitted its report. It was read by Mr. Lindall and contained recommendations on the maintenance of car bodies, trucks, electrical equipment and supplies and stated that economical maintenance can be materially enhanced by systematic accounting. Among those that discussed the report were Secretary Corning and Messrs. Winsor, Palmer and Roberts.

The concluding business of the convention was the adoption of the recommendations of the executive committee and the election of officers, which resulted in the choice of the following-named:

President—Paul Winsor of Boston.

First vice-president—F. H. Lincoln of Philadelphia.

Second vice-president—W. H. Evans of Buffalo.

Third vice-president—W. J. Harvie of Utica.

Secretary and treasurer—John W. Corning of Boston.

Executive committee—William Roberts, Akron, Ohio; E. O. Ackerman, Columbus, Ohio; L. L. Smith, Highwood, Ill.; Martin Schreiber, Newark, N. J.

The association then adjourned.

AMERICAN STREET AND INTERURBAN RAILWAY CLAIM AGENTS' ASSOCIATION

Owing to the absence of other officers, the chair at the first meeting on Monday was taken by Vice-president J. S. Harrison of Jacksonville, Fla. The address of the president, H. G. Goshorn of the Philadelphia Rapid Transit Company, was read by C. B. Hardin of St. Louis. Among other things Mr. Goshorn said: "It is usually the claim agent who is educating the men in the work of preventing and the proper handling of accidents. Astonishing results have been obtained. The number of accidents has been cut down, particularly the most serious kind, and the 'blind' or unreported cases greatly reduced. Instead of an average of two or three witnesses per report, the number has been raised on some roads to seven, eight and even more. On one division of our company we had last month an average of a fraction over 10, and on our entire system the average was 7.3 witnesses to every accident reported. How important this is in protecting a company against the numerous claimants who sustain injuries through their own negligence! With such an imposing list of eye witnesses you do not experience so often the feeling that it is cheaper to settle than to fight for your rights, regardless of liability."

The executive committee reported that W. H. Weh, second vice-president, has resigned because of his leaving the employment of the Cleveland Electric Railway Company to engage in other business. The committee reported that there had been some discussion about forming a national index bureau for protecting the claim departments of railways, liability insurance companies, manufacturing companies, etc. The president was instructed to prepare circulars describing the operations of the local index bureau organized in Philadelphia by Mr. Goshorn.

Two papers were presented at Tuesday morning's session—"The Organization of a Claim Department for a Small or Moderately Large Company, Including a School of Instruction as a Means of Preventing Accidents," by Francis J. Ryan, M. D., Syracuse Rapid Transit Company, Syracuse, N. Y., and "The Claim and Its Disposition," by Peter C. Nickel, claim agent, New York City Railway Company. There was some discussion.

At the afternoon session two more papers were presented—"Uniformity in Claim Department Records," by J. J. Reynolds of the Boston Elevated Railway, and "Duties of Claim Agents to the Public," by Eugene R. Roberts of the Knoxville (Tenn.) Railway and Light Company.

Officers were elected as follows: President, C. B. Hardin, United Railways Company of St. Louis; first vice-president, E. C. Carpenter, Indiana Union Traction Company; second vice-president, J. S. Harrison, Jacksonville Electric Company; third vice-president, Dr. F. J. Ryan, Syracuse Rapid Transit

Company; secretary and treasurer, D. B. Davis, Columbus Railway and Light Company.

Closing business was transacted on Wednesday. President Hardin, after a short address, appointed the executive committee as follows: James R. Pratt, Baltimore; John J. Reynolds, Boston; Mr. Brown, Newark, and E. R. Roberts, Knoxville, Tenn.

AMERICAN STREET AND INTERURBAN RAILWAY TRANSPORTATION AND TRAFFIC ASSOCIATION

The first session of the new Transportation and Traffic Association was opened on Monday afternoon with the presidential address delivered by C. Loomis Allen of Utica, N. Y. As related in the Western Electrician of last week, there followed a discussion of the constitution and by-laws, after which J. H. Pardee read the paper of Ernest Gonzenbach, entitled "How Can a Small Road Best Promote Traffic and Increase Its Revenue."

The report of the committee on training of transportation employes, one of the most complete and condensed papers presented to the convention, was read Tuesday morning by the chairman, J. W. Brown, and noted the increasing requirements demanded of the men with the improvement of equipment, schedule and speed. The report was discussed at length by P. P. Crafts of Clinton, Iowa, E. E. Potter of Seattle, Wash., Dana Stevens of Cincinnati, O., Robert F. Goff of Boston, Mass., C. E. Learned of the Boston Elevated Railway, F. Hardy of Ft. Wayne, Ind., J. H. Pardee of New York, C. Loomis Allen of Utica, N. Y., Mr. Cameron of St. Louis, Mo., Mr. Stevens, Mr. Leonard, W. R. W. Griffith of Rochester, N. Y., Mr. Sylvester, Mr. Hegarty of Little Rock, J. E. Duffy of Syracuse, N. Y., Mr. Shanahan, E. F. Peck of Schenectady, N. Y., and Mr. Sullivan of Chicago. Each gentleman spoke chiefly of his local conditions, and the wide distribution and diversity of the companies represented resulted in the contribution of much valuable data.

The Hon. W. Caryl Ely was then escorted before the convention and delivered the "congratulatory address" planned in the original program for the preceding day, in which he bore eloquent tribute to the duties and possibilities of the transportation department of a railway system.

The paper of C. H. Hile of the Boston Elevated Railway on the subject "Carrying United States Mail on Street Railways—Its Advantages and Disadvantages and the Compensation Therefor," was next presented. Beginning with an historical account of the early days of the electrical transportation of mail by street cars, the extracts compiled by Mr. Hile brought the subject up to a recent date showing that: "The number of electric and cable-car routes in operation on June 30, 1907, was 487, with a length of routes of 6,343.89 miles and an annual travel of 11,302,554.95 miles. The annual rate of expenditure, exclusive of the Chicago underground electric service ($172,600), was $614,-007.39. This is an increase in the number of routes of 5.87 per cent., in length 5.47 per cent., and in annual travel 1.69 per cent.

"The readjustments of compensation under the provisions of the law authorizing increases where the quantity of mail is large and the number of exchange points numerous and upon routes where weighings have been ordered have proceeded, resulting in a net increase of compensation of $55,-861.15."

J. T. Choate, Oneonta, N. Y., led the discussion of Mr. Hile's paper. He drew attention to the improved service rendered rural merchants by frequent and rapid mail transportation. Mr. Choate mentioned an interchangeable mail compartment so constructed that it could be quickly removed from one car to another. A critical discussion of rates made up the greater part of Mr. Choate's contribution which had been prepared beforehand.

On Wednesday morning the discussion of Mr. Hile's paper was continued. General Harries of Washington spoke of the peculiarity of certain government business methods. Mr. Hippee of Des Moines, Iowa, Arthur W. Brady of Anderson, Ind., D. A. Hegarty, Mr. Ross of Montreal, Canada, Mr. Crafts, Mr. Hile, James Anderson and F. R. Woy engaged in an interesting and instructive discussion of electric-railway mail service with regard to its tariff aspects.

The report of the committee on express and freight traffic preceded the paper of C. V. Wood, general freight and passenger agent, New England Investment and Security Company, Boston, Mass., on "Progress to Date in Carrying Freight and Express Matter by Electric Roads—Some Mistakes that Have Been Made and Their Remedy," and a joint discussion was held on the two papers. The committee's report was based on the answers to a set of 32 questions mailed to 303 electric-railway companies, and the material was presented in the terms of the answers received.

Mr. Woods' paper, which, owing to the author's illness, was read by G. W. Parker, was a logical account of the growth of the electric freight and express business, and was illustrated by a number of blank waybills and shipping receipts. The author referred to the importance of a uniform system, from which basis electric railways as a whole should start to build up and extend their freight business. This basis, he believed, to be car transportation alone. "Side issues," he said, "should not stand in the way or prevent the electric railways from getting together on some common ground of procedure, in laying the foundation for a system of cheap and speedy transportation of merchandise that will prove of universal benefit."

In beginning the discussion of this paper, E. H. Hyman, general manager of the Cleveland (Ohio) Electric Traction Company, said he believed that either the freight or express business, if run alone in the right locality, could be made to earn money, but not if run together, as some companies try to do. He explained that if a railway operates both systems at the same time there is liable to be contention among the shippers and confusion regarding the shipments. There are other lines, he said, which have a happy medium between the two rates, neither as low as the steam railroads nor as high as the express companies. He believed that a line running through a populous territory with large cities for terminals should have an exclusive express business with delivery.

B. E. Wilson of Rochester, N. Y., Mr. Hippee, G. W. Parker of Detroit, Mich., General Harries, P. P. Crafts, Mr. Hile, Mr. Nichol, Mr. Plummer of Asheville, N. C., Mr. Brady of Anderson, Ind., Mr. Pardee, W. C. Ross, Mr. McCarter of Newark, N. J., and Mr. Potter of the Seattle Electric Railway closed the discussion of the subject of freight and express service.

In setting out the topic of "The Possibilities of a Well-conducted Publicity Department," it was thought best to approach the subject from five viewpoints. Accordingly a large field for discussion was opened. "Human nature is the same the world over," said Chairman Warnock, "and if you are inclined to treat the public fair I think you will find that golden good-will of fine fellowship to you that cannot be purchased. Put sentiment and good-will in your community and try to let the people know that you are trying to do the decent thing and you are going to have the hue and cry of reduced fares heard very dimly in the past."

Charles E. Flagg, advertising agent for the Inland Empire System, Spokane, Wash., took up the subject of "The Possibilities of a Well-conducted Department of Publicity," drawing as an example the situation of his own work in the Spokane or "Inland Empire" country. "Practical experience on newspapers," he said, "has proved to us that no two communities are susceptible to exactly the same style of advertising. All literature should be strictly high grade and compare favorably with the excellent train service maintained. We often hear criticisms about the expensive literature issued, but we insist that one folder that is artistic enough to be kept and shown or mailed to others covers more ground and makes a greater impression than 20 common, ordinary leaflets which are glanced over and thrown away. We have never yet seen one of our folders discarded on the floor of our cars or depots. We have photographers that can do justice to our scenery, as a glance at our albums will prove. We select our best views for enlarging and have them framed and hung in our depots and in public buildings. We also have complete photo albums in our general passenger and publicity departments as well as on our parlor cars, with the idea of entertaining and educating the public. Photography is also playing an important part in our claim department, showing, as it does, the relative position of the cars, crossings, etc., when accidents occur."

A second paper on the same subject was written by B. R. Stephens, traffic manager, Illinois Traction System, Springfield, Ill. He told of a plan that had proven very successful. "We have followed the idea," he said, "that if we continued the practice of placing directly in the hand of the people interested the knowledge of the time of our cars and the rates we charged we would, in the course of time, entirely obliterate from their minds the fact that any other method of transportation was in existence in our territory, and when they desired to travel to any point we reached they could think of no other route. I firmly believe that we have succeeded in our efforts. We have continued the practice of issuing this folder every 60 days, now distributing 65,000 each issue, 22 pages each, and giving the local time card of each division, through time card of all through limited trains and their connections, information as to through rates, sleeper service, Sunday excursions, and not forgetting to call attention to our express service. Your publicity department must not allow any town or city on your line to fall into a comatose condition. It must be kept alive and made to attract people from the surrounding territory. The citizens must be made to see the necessity of giving Fourth of July and Labor Day celebrations, street fairs, carnivals, band concerts and various other amusements to attract the people from the surrounding country."

George S. Brush of the Boston Elevated Railway Company opened Thursday's session with a presentation of his conception of the possibilities of a well-conducted publicity department. In summing up his paper he concluded: "Give the publicity man all the freedom possible; give the newspapers the truth or nothing; give the public its money's worth; tell the truth in your advertisements, and have the best work in printing, and the publicity department will be a success, because a satisfied patron is always the best advertisement."

G. H. Gall of Baltimore advised the connection of a practical newspaper man with the publicity department of the electric road. "It is important to see that when the road does a thing worthy of public notice it should be properly exploited. The publicity manager should be right on the job, and in case he finds that any paper is not going to give an account satisfactory to him, he can write the story himself. The city editor will usually be glad to take it all and save the time of his own reporter."

Charles W. Lamb, formerly publicity manager for the Milwaukee Electric Railway and Light Company, gave similar advice.

While the subject of publicity was before the convention Chairman Warnock read a short and impressive statement from President W. A. House of the United Railways, Baltimore, contained in a personal letter. He wrote in part:

"All corporate interests should recognize that, to a greater extent than ever before, it is to their advantage to supplement and support their regular legal staff by skilled advertisers, not in the usually accepted sense of the word 'advertising,' but by employing agencies and men who have the requisite experience, acquaintance and connection and are expert in grouping and presenting facts to the public—in short, persons who are qualified to carry on an educational campaign concerning the interests they represent."

E. A. Kendrick, secretary of the Matthews-Northrup Works, Buffalo, N. Y., was called on and commended the wholesome tone of the papers read. He advised first-class advertising matter containing choice pictures along the right-of-way, well executed and judiciously distributed.

The session closed with a talk by H. A. Faulkner, passenger agent of the Boston and Northern Railroad, who is at the head of a unique information bureau maintained in a public location in Boston and offering impartial information on any railway so far as possible. His bureau supplies 150 newspapers and publications in 90 cities and towns and issues a great deal of literature, besides 40,000 copies monthly of a 12-page publication, "The Tri-State Tourist."

J. N. Shannahan, chairman, presented the report of his committee on interurban rules.

In commenting on this code of rules he said: "We have made a number of changes from the code adopted at Columbus, and some are radical changes. This has been pretty well thrashed over during the past two years. Many of the state railroad commissions have taken the matter up, and we found that it seemed to us that our work would largely lie in getting the codes to harmonize, so that if possible all the roads in the country operating high-speed lines could adopt the same codes." These rules form a complete manual of operation, containing general instructions, definitions of signals, time cards, train signals and train movement. A lengthy discussion followed.

D. F. Carver, receiver, Trenton and New Brunswick Railroad Company, Trenton, N. J., read a paper on "The Operation of Multiple-car Trains on Interurban Roads." The subject of multiple-car trains in city streets is one which is late in development and requires thought along new lines. The subject of multiple-car trains on interurban railroads is a broad one, full of specialization and technicalities. There are problems of the former which have not as yet been solved, but which, the author thinks, the developments and requirements of progress in the art will demand shall be solved.

The committee on passenger traffic, Duncan McDonald, chairman, and the committee on rules for city operation, M. C. Brush, chairman, then submitted their reports.

The nominating committee, consisting of R. E. Hunt, chairman, Salt Lake City, Utah, C. D. Emmons, Fort Wayne, Ind., and R. E. Danforth, Newark, N. J., brought in its nominations in the form of a report. Its proposals were accepted and the election of the following officers confirmed by the association:

President, C. Loomis Allen; first vice-president, R. I. Todd; second vice-president, G. L. Radcliffe; third vice-president, A. W. Warnock; executive committee, the officers and G. W. Parker, Detroit, Mich.; H. C. Page, Springfield, Mass.; N. W. Bolen, Newark, N. J.; H. A. Davis, Nashville, Tenn.

President Allen in a short speech testified he was grateful for the honor accorded him and in closing advised that the convention should accept the constitution and by-laws. On a motion which followed this was accordingly carried by the convention. After brief discussion the Association adjourned.

EXHIBITS

The exhibition of street-railway machinery and appliances on the new Million Dollar Pier was large, well arranged and attractive. It covered about 60,000 feet of floor space and was perhaps the finest display of the kind ever made. The Manufacturers' Association, which was in charge, is entitled to cordial praise for its well-planned and well-executed work. Among electrical and mechanical exhibitors were the following named:

Allis-Chalmers Company, Milwaukee; American Steel and Wire Company, Chicago; Anderson Manufacturing Company, Boston; Atlas Railway Supply Company, Chicago; Bayonet Trolley Harp Company, Springfield, Ohio; Blake Signal and Manufacturing Company, Boston; H. P. Brown, New York; Buckeye Engine Company, Salem, Ohio; Buffalo Foundry and Machine Company, Buffalo, N. Y.; Chicago Pneumatic Tool Company, Chicago; Consolidated Car Heating Company, Albany, N. Y.; Crouse-Hinds Company, Syracuse, N. Y.; D. & W. Fuse Company, Providence, R. I.; Dearborn Drug and Chemical Works, Chicago; Joseph Dixon Crucible Company, Jersey City, N. J.; Dossert & Co., New York; Electric Railway Improvement Company, Cleveland, Ohio; Electric Service Supplies Company, Philadelphia; Electric Storage Battery Company, Philadelphia; S. K. Elliott Electric Company, Cleveland, Ohio; Eureka Tempered Copper Works, North East, Pa.; General Electric Company, Schenectady, N. Y.; General Storage Battery Company, Boonton, N. J.; G. M. Gest, New York; Gould Car Heating and Lighting Company, New York; Gould Storage Battery Company, New York; Heany Fire Proof Wire Company, York, Pa.; H. W. Johns-Manville Company, New York; Lord Electric Company, New York; Massachusetts Chemical Company, Walpole, Mass.; National Brake and Electric Company, Milwaukee, Wis.; National Carbon Company, Cleveland, Ohio; R. D. Nuttall Company, Pittsburg; the Ohio Brass Company, Mansfield, Ohio; Philadelphia Electrical and Manufacturing Company, Philadelphia; Speer Carbon Company, St. Marys, Pa.; Standard Paint Company, New York; Standard Underground Cable Company, Pittsburg; Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y.; United States Electric Company, New York; Union Electric Company, Pittsburg; Van Dorn Electric and Manufacturing Company, Cleveland, Ohio; Wagner Electric Manufacturing Company, St. Louis; Western Electric Company, Chicago; Westinghouse Electric and Manufacturing Company, Pittsburg; Westinghouse Machine Company, Pittsburg; Westinghouse Traction Brake Company, Pittsburg.

LIGHTING COUNTRY HOMES

[*Continued from page 305.*]

mate could be cut down so as to make a cheaper, though a very satisfactory installation. Such changes will decrease the cost $78.50, making the plant cost a little more than $470.

For anyone who can afford a more expensive plant than the one we have designed there are several changes that can be made. In the apparatus of the engine room, i. e., the engine, battery, dynamo and switchboard there are not many changes that could be made to great advantage. A gasoline engine made especially for driving a dynamo can be bought at an increase of 25 per cent. in the price quoted. These are much heavier than the one decided upon and will therefore run much more smoothly and give better satisfaction if lights are ever operated from the dynamo itself. A larger storage battery can be obtained if it is not desirable to charge often. The fixtures used in this design are very simple and inexpensive. If it is desired, much more elaborate and artistic ones can be bought.

Cost of Operation

The principal cost of running a plant such as the one designed is the cost of operating a gasoline engine. A two-horsepower engine will cost about 5 cents per hour for gasoline, running at full load. When the engine is driving the dynamo alone it is giving about 0.7 horsepower and the cost of gasoline is about 1.8 cents per hour. These figures are assuming gasoline at 18 cents per gallon. The dynamo costs very little to operate; almost the only item is that of oil for the bearings. This is, of course, small. The storage battery requires no supplies except that occasionally some sulphuric acid will have to be added to the electrolyte of those cells whose specific gravity has fallen low. The acid costs only about five or six cents a pound and only a small quantity is needed, so this item is almost negligible. Depreciation is the most important item in storage-battery operation, and this depends altogether upon the treatment of the battery. It matters not how good or how poor a cell may be, careless treatment will reduce its life of useful service to a few months. The cost of maintenance or making good this depreciation is practically that of renewing the plates. With careful use the positive plates of a battery such as has been selected for this design will probably need renewal in four or five years and the negatives in eight or ten years. This will make the average annual cost of maintaining the battery $8 or $10 per year.

ALTERNATING-CURRENT DISTRIBUTION

At the meeting of the Electrical Section of the Western Society of Engineers on October 16th a paper on "The Development of an Alternating-current Distributing System" was presented by H. B. Gear, of the Commonwealth Edison Company, Chicago. The paper was illustrated by lantern slides and was followed by a short discussion.

Mr. Gear showed that the service supplied to an outlying or suburban district must necessarily be given through the medium of alternating current on account of its scattered nature. This involves three principal elements—primary feeders and distributing mains, transformers, and secondary distributing mains. The growth of the distributing system was considered in the order in which it actually takes place, which is the reverse of the above.

During the earlier stages of development of the secondary system there is little occasion to connect secondary mains in multiple. Where the mains have been extended until they meet each other it is usually preferable not to connect them, as the blowing of the fuse of either transformer shifts the load to the other and overloading it blows its fuse also; and transformers are so far apart that they cannot share each other's load to any appreciable extent in case of an overload on either of them.

It is therefore necessary in practice to locate transformers as closely as possible to such large consumers' premises and design the main between them to carry the scattered consumers whose load is approximately evenly distributed. An extended secondary main may therefore be made up of several sizes of wire at different points with transformers having various spacings, depending upon the load density in the vicinity.

When the development has reached its last stage, resulting in a network consisting of secondary mains running at angles so that they cross each other and may be interconnected at intersecting points, the transformers are located at points of intersection so that they deliver current in each direction with the best economy of copper. The transformers thus maintain the full feeder end pressure at all junction points where they are placed, as the primary mains are usually so short that there is no appreciable drop in them. This is an advantage over a direct-current network where each feeder is connected to the network in only one or two places, and the mains must have greater capacity in order to maintain an even pressure throughout.

Where both power and lighting service must be given in the same locality, provision must usually be made for separate transformers and secondary mains for power service on account of the poor regulation of transformers carrying inductive loads which produces flickering and insufficient light when motors are connected to the same transformers with the lighting.

Where there is a fairly heavy load of both light and power to be served, it is often a serious question to determine the best methods of giving light and power service with a minimum investment in conductors. Where the power load is less than 50 per cent. of the total, and where the transformer capacity is so great that starting current of individual motors is not noticeable, it is permissible to combine lighting and power secondaries in one system. This may be done on either the two or three-phase system by putting the lights on one phase. In the case of a very dense load carried on underground mains, where the size of transformer units is as large as it is practicable to use, the four-wire three-phase secondary with transformer secondaries Y-connected has certain advantages. With a network, the larger diversity factor tends to facilitate the work of maintaining a balance and to minimize the objections which apply to this system where it is used on smaller load densities.

The selection of the proper size of transformers for the supply of various classes of consumers is a matter of great importance since excess capacity involves idle investment as well as unnecessary core losses. The size of transformer units should therefore be kept as low as possible consistent with heating of the apparatus and good regulation. Improvements in recent years have resulted in the reduction of iron losses to a minimum, but there is some doubt as to whether the recent tendency to make a saving in the weight of copper required by increasing the leakage current is one which should be encouraged.

Mr. Gear then considered the various systems of primary distribution, citing the advantages of single-phase, two-phase and three-phase systems when carried out on the three and four-wire methods. He showed that the tables of relative amounts of copper required that are commonly given are apt to be misleading since operative advantages frequently outweigh copper economy. He closed his paper by dwelling on some of the problems encountered in overhead and underground construction of distributing lines.

The discussion was participated in by D. W. Roper, G. H. Lukes, J. R. Cravath, P. Junkersfeld and the author of the paper.

LONDON INTERNATIONAL CONFERENCES

London, October 9.—An international conference on electrical units and standards was begun on October 5th in London. This conference is held at the invitation of the British government, and its main object is to obtain international agreement on the three electrical units, the ohm, the ampere and the volt, so that the realization of these units in all the countries of the world shall be as near as possible identical. The best methods of setting up the mercury ohm, the silver voltameter and the cadmium cell will be considered, and it is hoped that detailed specifications may be issued with the authority of the conference.

Next week the International Electrotechnical Commission, which was formed at the time of the St. Louis Congress in 1904, will meet in London to appoint a new president in the place of the late Prof. E. Mascart. I understand that Prof. Elihu Thomson has been selected. The United States delegates to the government conference mentioned above are Prof. H. S. Carhart, Dr. S. W. Stratton and Dr. E. B. Rosa. Delegates will attend from Belgium, Denmark and Sweden, France, Ecuador, Germany, Great Britain, Guatemala, Italy, Japan, Mexico, Netherlands, Paraguay, Spain, Switzerland, United States, Australia, Canada and India. G.

SONS OF JOVE AT BUFFALO

The sixth annual congress of the Sons of Jove at Buffalo on October 15th and 16th was a distinct success. Many subjects of interest to Jovians were discussed, and the entertainment features were enjoyable. At the business session of October 16th these officers were elected for next year's congress:

Jupiter, J. Robert Crouse, Cleveland; Neptune, James R. Strong, New York city; Pluto, John W. Brooks, Syracuse; Vulcan, Homer E. Niesz, Chicago; Hercules, J. R. Dostal, Denver; Mercury, C. B. Roulet, Dallas, Tex.; Mars, W. A. Layman, St. Louis; Apollo, E. D. McCarthy, Buffalo, and Avrenim, T. E. Bibbins, San Francisco.

The next meeting place of the Jovians is left to the discretion of the Reigning Jupiter, who will announce his selection at a later date.

The concluding feature of the Buffalo meeting was a brilliant banquet at the Iroquois on the night of October 16th. W. E. Robertson, the retiring Jupiter, was toastmaster, and other speakers were Charles R. Huntley, H. B. Kirkland, J. Robert Crouse, Oscar C. Turner, Herbert I. Sackett and Alex Henderson. There were no set speeches and the talks were along the lines of fraternity and co-operation.

BANKS ACCEPT WESTINGHOUSE PLAN

Following the agreement of the New York banks to accept in settlement of their Westinghouse Electric and Manufacturing claims 50 per cent. stock and 50 per cent. bonds, it is announced that the Pittsburg banks have all agreed to a settlement on the same terms. The acceptance of the New York and Pittsburg banks involves $1,050,000 held by the banks in New York and $1,075,000 held by the banks in Pittsburg.

The fact that the New York and Pittsburg banks have agreed to the plan of settlement will be followed by similar action on the part of the smaller banks in other cities holding claims against the Westinghouse company. Many of the note holders have agreed to accept all stock at par in settlement of their claims.

ALTERNATING CURRENTS AND THEIR APPLICATIONS

By Edson R. Wolcott

CHAPTER I.—GENERAL PRINCIPLES

Part IV.

Induction

Fundamental Principle of Alternating Currents

The fundamental principle involved in the application of alternating currents is that of induction. When a current is flowing through a wire there is a magnetic field surrounding it, as is shown by the old experiment of sprinkling iron filings on a horizontal paper through which passes a vertical wire carrying a current. The filings arrange themselves in circles around the wire, showing that there is a circular magnetic field surrounding it.

It takes energy to build up this magnetic field, but the energy so used is not all wasted; it is simply stored up, like that of a steel spring, for most of it comes back as an electric current when the circuit is broken. It is perhaps more like the inertia of a moving body. Thus, on closing the switch of an electric circuit, it is scarcely realized that it takes time for the current to reach its full value, for the time required is only a small fraction of a second. Likewise, when the switch is opened, there is a tendency for the current to keep flowing, due to the energy stored in the magnetic field; this appears as an unusual rush of current at the instant of breaking the circuit, the result being an arc.

Self-induction

This action can be compared to the inertia of a railway train. Just as it takes time for the electric current to reach full value when the switch is turned on, so it takes time for a railway train to attain full speed when the steam is turned on. In the first case, energy is being stored in the magnetic field; in the second, energy is being stored in the moving train. It reappears in the latter case when the train is coasting, just as the energy of the magnetic field reappears as a current in the wire when the circuit is broken. The addition of this current to the one already flowing makes the large current of the break. This phenomenon is known as self-induction.

It is evident that the magnetic field can be made stronger by coiling a linear conductor; the lines of force are then brought closer together. Introducing such a coil into a direct-current circuit would mean that more energy would be stored up in the magnetic field, since the latter would be stronger, and hence there would be a greater arc on breaking the circuit.

This is equivalent to adding cars to the train. With a heavy train it will take more energy to start and more energy will be stored up, thus permitting the train to coast longer and making it more difficult to stop it.

Effect of Iron

Iron has the peculiar property of being a better storehouse for magnetic energy than air, and consequently when iron is introduced into the coil of wire the magnetic field is still stronger, and consequently much greater inductive effects are obtained.

Solenoid in an Alternating-current Circuit

When such a coil, or solenoid, as it is called, is introduced into an alternating-current circuit, where the magnetic field is continuously being built up and torn down, it is evident that the inductive action will be much more noticeable. Likewise, it would be much more difficult to start and stop continuously a heavy train than a lighter one, because of its momentum.

Although there is an increased opposition to the flow of the alternating over that of the direct current, it does not follow that there is a proportionally increased loss of energy. The opposition is caused by the storing up of energy which is not all lost, but which comes back to the circuit, as already explained. To be sure, there is some extra loss, for energy cannot be stored and used later without friction losses of some kind. These losses will be considered later in more detail.

Mutual Induction

The reason for the application of the principles of induction is, of course, not because of this increased opposition, but because another alternating current is induced in a separate conductor which lies within the changing field produced by the alternating current of the solenoid. This is known as mutual induction. This current is easily regulated to meet the requirements, and is economically produced. The apparatus used in producing this transformation of electrical energy into magnetic energy and then back again into electrical energy is the transformer.

Transformers

Principles of the Transformer

In its simplest form the transformer consists merely of an iron ring upon which are wound two insulated coils or solenoids, as shown in Fig. 12. *R*

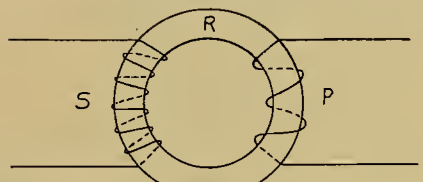


FIG. 12. SIMPLE TRANSFORMER

is the iron ring upon which is wound the primary winding *P*, in this case consisting of three turns of insulated wire; *S* is the secondary winding and consists of six turns of insulated wire.

When the primary *P* is connected to an alternating-current generator, magnetic lines of force are generated in the iron ring *R* and encircle it first in one direction and then in the other; the alternations correspond to those of the current. The effect of these fluctuating lines of force on the secondary winding *S* is the same as if the lines of force were stationary and *S* were moving back and forth at the same rate; that is, an alternating current is induced therein, the frequency of which is the same as that in the primary *P*.

Ratio of Voltage in the Two Windings

The greater the number of turns in the primary *P* the greater will be the number of lines of force, or magnetic flux, as it is sometimes called, that encircle *R*. The greater the number of turns in *S* the greater will be the electromotive force generated therein, since all of its coils are in series and additional coils mean additional effects. The electromotive force generated in the secondary depends simply on the ratio of the number of windings in one coil to that in the other, thus:

$$\frac{E_s}{E_p} = \frac{N_s}{N_p}$$

where E_s represents the electromotive force generated in the secondary *S*, E_p that applied to the primary *P*, N_s the number of turns of wire in the secondary coil *S* and N_p the number of turns in the primary.

For example, if the number of turns in the two coils is the same the electromotive forces in the two are the same; if the number of turns in the secondary is twice that in the primary the electromotive force generated in the secondary will be twice that applied to the primary. It is then called a step-up transformer. Of course the generator could be connected to the coil having the greater number of turns and the latter would then be called the primary of a step-down transformer.

The principles of induction, therefore, offer very convenient means of obtaining an electric current of any desired voltage. To be sure, the current is alternating and not direct, but the alternating current can be used for motors, lighting, and in fact most of the applications of electricity except storage-battery charging and electrodeposition of metals.

Furthermore, the construction of the transformer is simple and its efficiency very high. The ordinary type working under normal conditions easily attain an efficiency of 97 per cent.

[*To be continued.*]

Note.—This serial was begun in the Western Electrician of October 3, 1908.

A GREAT POWER DEVELOPMENT

Those in charge of the huge electric power schemes in the northeast corner of England, with which the name of Mr. C. Merz is now intimately associated, writes the London correspondent of the Western Electrician, seem to possess a remarkable characteristic in that great deeds are performed with the minimum of ostentation. A paper just read by Mr. Merz before the Iron and Steel Institute, however, gives some up-to-date information of a general character which is worth recording.

There are three power companies, at one time more or less competitive, which have joined forces. The greater proportion of energy, however, is supplied from the famous Carville power station, which was commenced five years ago by the installation of machinery having a capacity of 14,000 electric horsepower. At present, however, the capacity of this station has been increased to 56,000 electric horsepower, which is said to be greater than that of any other public supply station in Europe. The supply is at 6,000 volts, 40 cycles, three-phase, and while the plant capacity of the three companies represents one-ninth of the total installed in all the public supply stations of the United Kingdom, the output from them is equivalent to no less than one-quarter of that generated in the whole of the public supply stations of the kingdom. The system now consists of five coal-fired stations and three waste-heat stations, while a further coal-fired station and two waste-heat stations are under construction. The total capacity of the machines in all these stations will then be 136,550 horsepower. As further demonstrating the size of his undertakings, Mr. Merz mentioned that they supplied 80 miles of electric railway, four tramway systems, the lighting of towns with an aggregate population of 700,000 people to the extent of 85,000 horsepower and electrochemical works up to 12,000 horsepower. Arrangements with the owners of coke ovens are being made to utilize the waste heat in connection with generating machinery, the main power stations acting as the standby, a combination which has been found to work out very favorably to the coke-oven owner.

PRODUCTION OF TUNGSTEN

The principal tungsten minerals are wolframite, a tungstate of iron and manganese and scheelite, a tungstate of calcium. Both minerals, like tin ores, occur as a rule in quartz veins cutting rocks containing much silica, such as granite and rhyolite. The deposits are usually pockety; that is, the ores occur in lenticular masses or shoots in veins. Those occurring at the surface are often quickly and easily mined, and it may then require all the profits made from the first exposed ore body to locate another one. In New Mexico, hübnerite and a small amount of scheelite occur with pyrite and lead minerals in a vein cutting limestone; and at Nome, Alaska, scheelite is found in the gold placers in a region of schists several miles from the nearest granite outcrops.

The greater part of the American tungsten product in 1907 came from the mines in Boulder County, Colo., which reported an output of 1,146 tons of wolframite valued at $573,642.74. In California, which was the second state in order of production, the output was in the form of scheelite, as was also most of that from Montana. The total scheelite reported was 414 short tons. Small amounts of tungsten ores were also produced in Washington, Nevada, Arizona and New Mexico.

As a result of the increased demand for electrical purposes, the output of the United States was increased from a total of 928 short tons of concentrates carrying 60 per cent. of tungsten trioxide in 1906 to 1,640 short tons in 1907, while the value rose from $348,867 in the earlier to $890,048 in the latter year.

In other countries besides the United States the production of tungsten was notably increased during 1907. The output of Australia (including Tasmania), amounting to 1,643 tons, was, however, the only one that exceeded that of this country. Reports of production from South Africa, New South Wales and the northern territory of Australia show marked increases.

ILLINOIS CENTRAL FINED

In line with the present determined move made by the citizens of Chicago's South Side to require the Illinois Central Railroad to electrify its tracks within the city, the railroad company has been fined $50 for permitting dense smoke to issue from the stacks of three engines. The case was prosecuted by the city smoke inspector.

ELECTRICAL ENGINEERS OF THE IRON AND STEEL INDUSTRY

On October 14th to 16th there was held the second annual meeting of the Association of Iron and Steel Electrical Engineers in the rooms of the Western Society of Engineers, Chicago. The sessions were opened on Wednesday morning with the transaction of some routine business, after which the nominating committee submitted its recommendations for officers for the next year. These were unanimously adopted, the officers thus elected being: John C. Reed of Steelton, Pa., president; G. M. Sturgess of Buffalo, first vice-president; L. R. Palmer of Pittsburg, second vice-president; E. W. Yearsley of Philadelphia, treasurer (re-elected), and G. H. Winslow of Pittsburg, secretary (re-elected).

After a general discussion on standardizing of electrical apparatus, the first regular paper presented was "Electromagnets for Scrap-breaking," by George W. Richardson. After the luncheon recess a number of papers were read and discussed. These were "Lifting Magnets," by C. Pirtle of the Electric Controller and Manufacturing Company; "Electric Motor Drives," by E W. Yearsley; "Increase in Production by Machinery on Motor-driven Line Shafts," by G. H. Winslow; "Mill-type Motors and Controllers," by Messrs. Knight and Whiting of the General Electric Company; "Low-pressure Steam Turbines and Centrifugal Compressors," by Messrs. C. J. Callan and Birkland of the General Electric Company. In the evening the delegates were the guests of the General Electric Company for dinner at the Illinois Athletic Association and for a trip in automobiles to the Fisk Street station of the Commonwealth Edison Company.

Another inspection trip was arranged for Thursday morning, the party leaving in automobiles for the Western Electric Company's works at Hawthorne, where a luncheon was given them in the dining room of the works. After the return to the city another session was held in the afternoon. Two papers on "Low-pressure Steam Turbines" were presented, one by Edwin Yawger of the Westinghouse Machine Company and the other by Henry H. Wait. A paper on "Power Transformers and Alternating-current Motors" was read by W. A. Layman of the Wagner Electric Manufacturing Company, and "Alternating-current and Direct-current Motors" were discussed by Gano S. Dunn of the Crocker-Wheeler Company. In the evening a dinner was given by the Crocker-Wheeler Company to the electrical engineers in attendance.

Friday morning was given over to an inspection visit to the new extensive plant being built by the Indiana Steel Company at Gary, Ind., the trip being arranged by the Allis-Chalmers Company. E. T. Adams of that company submitted a paper on "Gas Engines and Turbo-generators" that was very pertinent to the occasion. Later a large number of the delegates visited the Illinois Steel Company's plant at South Chicago. The convention was well attended and showed the increasing strength of this comparatively young organization.

REBUILDING PARIS TELEPHONE SYSTEM

Active steps are being taken to repair the disaster caused by the Paris telephone fire which destroyed the Gutenberg or central exchange having connections with about 19,000 subscribers. After re-establishing the most important lines general partial relief has been afforded by connecting up a number of extra public telephone booths in the central district. A temporary shed to house the apparatus for the 19,000 subscribers is now being set up in the Rue de Gutenberg between the burned building and the central postoffice. Although somewhat narrow, this location is the best for the purpose, as the underground cables can be led into the temporary boards with a small amount of cable.

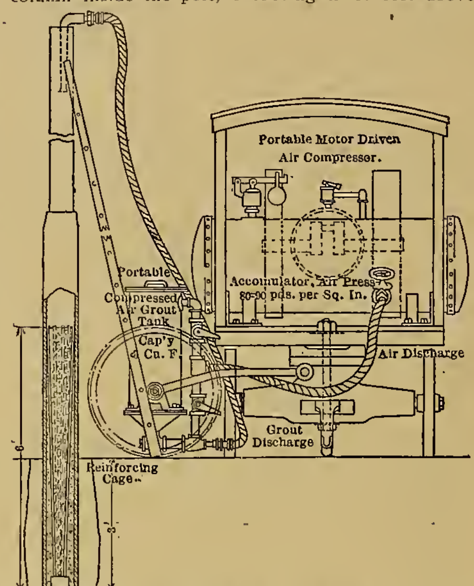
A set of small boards will be set up at once in the finished shed to accommodate the principal subscribers, and two multiple boards from different Paris constructors have been ordered for the general service. The work of installing the long-distance exchange in a private building near the present site is already begun. For one of the two permanent exchanges the gutted building will be reconstructed for a third multiple board. One of the multiple boards of the temporary shed finally will be placed in a new building, leaving the third board to be used as a standby. It is expected that the temporary exchange will be working within two or three months, while the remainder of the project will take perhaps ten months.

The material amount of the loss is estimated to be about $1,000,000, by far the greatest loss ever due to a telephone fire in Europe.

CONCRETE REINFORCEMENT OF CORRODED TUBULAR POLES

The corrosion of tubular trolley poles at the base has been a matter of serious concern to both manufacturers and operating companies. This weakening occurs from the street surface to a height of only a foot or 18 inches, and sooner or later destroys the pole. One of the largest traction companies in the country was recently confronted with the necessity of either strengthening or replacing several thousand trolley poles whose condition had become precarious through corrosion. After investigation and considerable experimentation a method was adopted in this case that has been perfected by the New York Pole Company, of which G. M. Gest, the well-known conduit engineer and contractor, is president.

The method employs a steel-reinforced cement column inside the pole, extending three feet above



INTERNAL REINFORCEMENT OF METAL POLES

and three feet below the street surface. The reinforcing cage of high-carbon twisted steel rods is first lowered through the top of the pole, and when in position the rods are allowed to expand against the pole by pulling off the restraining cap. In this way at the section of greatest stress, at the street surface, the rods afford the greatest theoretical reinforcement to the shell.

By means of a grout tank and a portable motor-driven air compressor taking current from the trolley wire, grout is then forced downward through the top of the pole, as shown in the accompanying sketch, surrounding the rods and forming a six-foot reinforced cement column.

Other methods of reinforcing corroded poles require a split or seamless sleeve to be placed around the base, calling for either the dismantling of the pole or the excavation of the sidewalk. The sleeve put around the susceptible part of the pole before being sent out by the manufacturers adds to the cost and serves to lengthen its life only a short while. Paint and other preservative compounds while more or less effective on the section joints are found to be useless when applied to the base of the pole. It is apparent that the strength imparted to the pole by any such sleeve is very limited, on account of the small bearing area. The sleeve is unsightly, is seldom placed symmetrically, and is expensive and tedious to arrange. The split cast-iron or cast-steel sleeve is even worse, requiring flanges and bolts.

The "New York" method reinforces for a length of six feet, three feet above and three feet below the street surface, and so should prove very much more effective than anything that has been offered. The pole does not need to be dismantled, if of the standard type, though with some special poles some dismantling may have to be done where there are rivets through the top. However, this is seldom the case.

The "New York" method requires only a few minutes for reinforcing each pole, so that no inconvenience results to traffic or pedestrians. No excavation is required around the pole and the reinforcement is, of course, invisible. The pole is not endangered by this process, as by some of the others.

With the "New York" method the pole may continue to corrode after being repaired, for the reinforced column by itself is stronger than the original pole. This is perhaps the best feature of the reinforcement, as the treatment is final. The mixture of the cement and the details and measurements of the high-carbon steel reinforcing cage have been worked out carefully by reinforced-concrete experts. Both the process and the cage are patented. The "New York" reinforcement seems the only type that has been successfully applied on poles that are "completely gone" at the base. It has been used with uniformly good results on both moderately impaired poles and on poles that were eaten entirely through and remained upright only because of the feeders attached to them.

The cost of repairing poles by this process is about 15 to 20 per cent. of the cost of new poles, and its application to a pole is final, ending the danger of further weakening.

The New York Pole Company, with offices in New York, Cincinnati and Chicago, is also getting up an outside concrete reinforcement, which is neat and unobjectionable.

PRACTICAL RESULTS OF ELECTRIFICATION

William S. Murray, electrical engineer of the New York, New Haven and Hartford Railroad Company, which has been operating the Westinghouse single-phase electric-railway system on a part of its lines during the last two years, in discussing his experiences with electrification, has this to say, according to the Boston News Bureau:

"The most commercially valuable answer as to the success of electrification on the New Haven is written in the actual operating schedule in the electrification zone. The train-minute delays suffered today by electrical operation are but a small percentage of those incurred during the period of steam operation.

"As the zone limits in our case were not a terminal proposition, the application of the direct current showed itself to be impracticable. On account of errors, always common in initiative work, the first few months' operation has been a period of interruption, which has naturally been annoying both to the road and the public. Today the delays have disappeared by the removal of their cause.

"The wisdom of the purchase of a locomotive consisting of two individual half units, the whole or half unit being operative by a single crew, has proved itself in the ability of the road to handle 75 per cent. of traffic with half-unit locomotives, using the whole unit on the remaining 25 per cent. of trains, whose weight demands the full drawbar. Should future requirements see the advantage of extension of electrification east of Stamford, the system is designedly applicable.

"As to the saving in cost of operation as compared with steam, I would state that operation today has not been a sufficient length of time to make this comparison. It may be interesting to note, however, that by exhausive investigation I have found that one pound of coal burned under the boilers of our central station produces twice the drawbar obtained by one pound of coal burned in the fireboxes of the steam locomotive, or, in other words, the fuel bill for electric traction is one-half of that required for steam traction. Other economies will arrive in the low cost of maintenance and repairs of the electric locomotive as against steam locomotives.

"The density of traffic is, of course, the paramount feature as to the savings to be effected by electrification. It is not to be forgotten that, in electrifying, interest, depreciation, insurance and taxes follow closely on the heels of the capital investment in equipment and material necessary to electric operation. The heavier the traffic, the greater will be the economies derived from the two above-mentioned sources.

"It is quite conceivable that the heavy ton-mileage in freight and passenger service on the Atlantic coast-line roads will effect savings sufficient to cover the above-mentioned fixed charges on the investment necessary to their electrification.

"The greatest value to be experienced by electrification will be in the tremendously increased traffic capacity of the present track mileages, due to the facility electricity offers in making rapid main-line and yard-train movement, or, stated in another way, it is thus immediately seen that electrification will permit a tremendous increase of traffic without an increase of track mileage, and thus roads which are up against the requirement of handling their congested traffic by laying new tracks, which, of course, is a most expensive procedure on account of right-of-way difficulties, will be led into providing an equal capacity by electrification of the old trackage."

ELECTRICAL INSPECTORS IN SESSION

The Western Association of Electrical Inspectors began its fourth annual meeting in Chicago on October 20th. The daily sessions were held in the assembly room of the Chicago Board of Underwriters on the twelfth floor of the National Life Building, and about 60 inspectors were in attendance at the opening meeting on Tuesday morning.

This session was given over to hearing the reports of officers and committees after the presidential address had been delivered by E. R. Townsend. Frederick G. Dustin, Minneapolis, delivered the report of the executive committee, and William S. Boyd of Chicago, secretary and treasurer of the association, followed with his official report. After the transaction of further business the following reports of committees were heard:

Committee on "Uniformity in Rulings," William S. Boyd, secretary, Chicago; committee on "National Electric Code," J. H. Montgomery, chairman, Detroit, Mich.; committee on "Outside Wiring," Waldemar Michaelsen, chairman, Omaha, Neb.

In the afternoon the members of the convention boarded automobiles and "inspected" the boulevard and park system of the city.

The concluding sessions of October 21st and 22d will be reported in the Western Electrician of next week.

MACHINE-TOOL MOTOR CONTROLLER

The self-contained drum-type machine-tool controller here illustrated is a recent addition to the line of electric controlling devices designed for use with motor-operated machine tools.

It possesses the advantage of combining in one compact piece of apparatus the speed-regulating mechanism and the resistance, instead of constructing these separately and requiring connections between the two to be made after the apparatus is installed.

Fig. 1. Front View (Cover Removed)

Fig. 2. Rear View (Back Plate Removed)

MACHINE-TOOL MOTOR CONTROLLER

Fig. 1 is a front view of this new type of controller and shows the removable resistance units mounted in the lower half of the controller, with insulated wires running from each unit to the metal "fingers" in the upper part of the device. These units constitute the armature resistance and are employed for starting duty only.

Fig. 2 is a rear view of the same drum and shows another type of resistance unit, also removable, mounted on the back of the controller. The four units shown in this view constitute the field-regulating resistance and are divided into 20 steps, providing a range of speed variation of 2 to 1 or 3 to 1.

These controllers are supplied for both reversible and non-reversible motors ranging from 1 to 7½ horsepower and are designed for use on either 100 or 220-volt, direct-current circuits. They are made by the Cutler-Hammer Manufacturing Company of Milwaukee.

WESTERN UNION ANNUAL REPORT

The annual report of the Western Union Telegraph Company, just issued, shows the effects of the strike of the operators and the general depression in business. The gross income dropped $4,274,194, or 13 per cent., compared with the previous year. There was, however, a heavy reduction in maintenance and construction charges, amounting to $1,138,935, or substantially 25 per cent. Meanwhile there was an increase in mileage. The final result for the year showed a decrease of $2,490,925 in the surplus. The gross income was $28,582,212, from which were deducted net operating and general expenses and taxes amounting to $25,179,215, leaving a net revenue of $3,402,997.

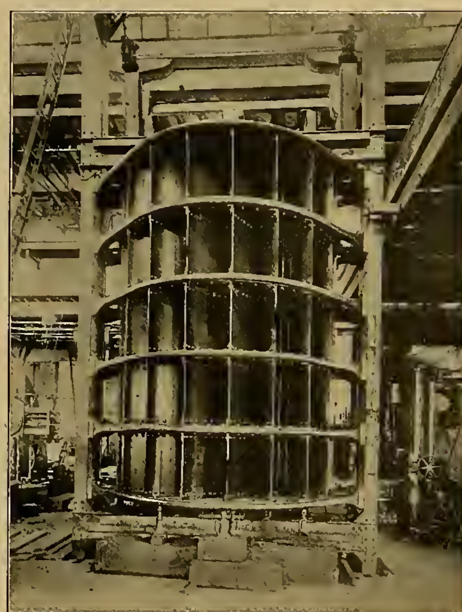
President R. C. Clowry said the bonded debt had increased $2,830,000 within the year, owing to an issue of $2,000,000 4 per cent. convertible bonds and $830,000 collateral trust bonds.

The net growth of the plant was in poles and cables, 2,821 miles. Of the total of 1,359,430 miles of wire at the close of the year, 485,801 miles were of copper, there being an increase in copper of 66,351 miles.

LARGE WAVE MOTORS FOR ATLANTIC CITY

John A. Snee of Pittsburg has invented an interesting type of wave motor, and has organized a company bearing his name to manufacture and exploit it. Two of these machines are to be installed at Atlantic City to generate electricity for light and power to be used on Young's new Million Dollar Pier, the plant being located adjacent to the pier and 1,150 feet seaward from the Boardwalk.

The revolving portion of the wave motor resembles in construction a turbine, and embraces an upright, cylindrical frame fitted with vertical parallel blades, revolving within a stationary shield. As shown in the accompanying illustration, from a photograph taken during construction, this outside shield consists of a series of deflectors or guide blades set at an angle to jet the force of the water into the interior of the wheel. The inside revolving structure is equipped with a form of vane that is quite unique. About midway against the curved blades straight blades are set at right angles, but not connected with the outside blade of the vane. The rush of water through the outside guide blades drives the inside wheel, revolving it in the same continuous direction. An efficiency of 80 per cent. is claimed.



A 61-TON WAVE MOTOR

The steel-reinforced concrete structure now completed at Atlantic City will be equipped with two 61-ton wave motors. These wheels are mounted on a hollow steel shaft hung on roller bearings. The outside guide blades, or deflectors, are of 9/16-inch steel plate riveted to cast-steel heads arranged in tiers 30 inches apart. The six steel heads used in the construction of each of these motors are 2½ inches in thickness and weigh 4,700 pounds each. These heads are in turn bolted onto 24-inch I-beams. The entire bladed deflector is bolted rigidly into the steel-reinforced concrete structure at a height to permit five feet of water in the wheel at low tide. The foundation rests on nine concrete piles, each containing 1,050 barrels of cement, reinforced with steel rails and bars. In addition to this piling, three steel-reinforced-concrete floors, weighing more than 100 tons each, make the structure a rigid mass of concrete and steel weighing more than 500 tons.

The two wave motors are to be installed about November 15th, it is said, and will be employed for the generation of electrical power. The manner of connecting wave motor and generator is not explained. A storage battery will be operated in conjunction with the generating plant for conserving the electrical energy between the periods of power supply by the wave motor.

NEW HOLOPHANE REFLECTORS FOR TUNGSTEN LAMPS

The Holophane Company has just completed the designs for a new line of reflectors for tungsten lamps. These reflectors are not only more efficient than old styles but a number of remarkable improvements have been incorporated in their design which the Holophane Company's engineers have heretofore considered unattainable.

NEW HOLOPHANE EXTENSIVE REFLECTOR

NEW HOLOPHANE FOCUSING REFLECTOR

The new tungsten reflectors are of three types, which will be known to the trade as the extensive, intensive and focusing types. In appearance all are similar to the original "bowl type" Holophane reflectors designed for Gem lamps, but each of the three new types gives a distinctive distribution of light. The extensive gives an improved bowl-type distribution; the intensive a good general distribution downward; while the focusing type is a strong concentrator. The extensive and focusing types are illustrated. The reflectors were designed to fit the requirements of modern store, office and hall lighting, and so fully do they serve the purpose intended that illuminating engineers are on record as stating that they have almost ideal photometric curves. In the preliminary engineering work connected with these new types the engineering department, Holophane Company, was ably assisted by Mr. A. J. Sweet of the Westinghouse Company.

In the designing of the reflectors a new principle was evolved, that of the "merging prism." As is well known, Holophane reflectors having a continuous prism from the collar to the edge lose considerably in efficiency, owing to the fact that the prism is much larger at the bottom than at the neck. To prevent this the Holophane Company designed what is known as the "equal step prism" reflectors, in which prisms of practically equal size are run in several banks from neck to top. In the new types, instead of an abrupt step between the banks of prisms, the several banks are merged one into the other, which not only adds greatly to the beauty of the reflectors but at the same time gives the maximum of efficiency.

The new "merging prism" reflectors are made for 40, 60 and 100-watt tungsten lamps, three types, as above described, for each size of lamp. This makes a very compact line and one which is uniform in appearance.

The new line will be handled not alone by the Holophane Company of New York but also by the General Electric Company, Westinghouse Electric and Manufacturing Company, Franklin Company and the companies comprising the National Electric Lamp Association.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, October 8.—Work has been carried on for some time on the increase of the St. Denis steam-turbine plant in the suburbs of Paris, and it will soon be finished. The plant will thus be provided with 10 principal units of 6,000 kilowatts each. The steam-turbine groups are furnished by the Brown-Boveri people, and at first four units were installed, but soon afterward it was found necessary to increase the plant, owing to the large amount of current which it was called upon to furnish for the Metropolitan subway and a certain number of the city mains. The turbines are coupled direct to three-phase alternators. The increase will nearly triple the original capacity of the plant, and it is now the largest steam-turbine station in Europe. The dynamo hall is a long building which can be increased in length indefinitely, and the turbines are mounted in sets of two placed across the width of the hall. For every four turbines there is built a separate building in the rear of the main hall, consisting of a boiler room and a coal-storage house. In this way extensions are easily made. It is expected that by 1910 there will be two other groups installed, so that the capacity will reach 72,000 kilowatts, or about 100,000 horsepower in steam turbines.

Current will be furnished for nearly 40 miles of the Metropolitan subway lines at this time, and at a later date the station will be called upon to supply the 25 miles of subway now building in Paris. The contract with the Metropolitan company lasts for 40 years, and it is stipulated that the St. Denis plant shall add to its capacity at the rate of 640 kilowatts per mile of subway which is finished, so as to keep up with the latter. A number of substations are already in use in the city which supply the direct current at 550 volts for the subway, and they receive the three-phase current from the St. Denis plant.

There are to be installed two sections of narrow-gauge electric railroad at Tabor, Bohemia, and these will be an extension of the Tabor-Bechin railroad, which has been operating for some time. One of the new sections will branch out from the existing terminus of the line at Tabor, while the second line will start from Bechin and proceed to Moldautein.

After having granted concessions for the gas and electric-light supply, the city of Ostend, Belgium, decided to adopt the principle of municipal operating of these plants. The report of the municipal commission on this point was unanimously adopted by the Council, and it is intended to take measures for commencing the municipal working of the plants by the first of the year.

Among the recent electrical projects in France I note the new hydraulic work which is to be carried out upon the Ain River. Besides the already projected plant at Cize, there will be a new plant erected on the same stream, which is expected to give 3,000 horsepower, or about the same as the first plant. A suburban electric-tramway line is to be constructed from Dijon to the town of Gevrey. There will also be an electric rack-railroad constructed so as to connect the town of Besançon with the plateau of Bregille. A. DE C.

GREAT BRITAIN

London, October 9.—On Saturday last there was a stoppage upon the four London electric railways supplied from the Lot's Road (Chelsea) generating station, for about two hours, which caused a considerable amount of alarm, happening as it did in the middle of the afternoon, when all the trains were crowded with passengers. Fortunately, there was not a single casualty, in spite of the trains being plunged in darkness and the fact that the passengers had to walk along the track guided by officials with hand-lamps. Likewise, all the electric elevators were brought to a standstill, many of them half way between the street level and the underground stations, but the safety devices worked perfectly and the cars were afterward hoisted up by means of jacks.

The accident was of some technical interest, and, thanks to an official message which has since been sent around to the technical press, some light is thrown upon the matter. It appears that at 2:45 p. m. on Saturday, with five 5,500-kilowatt generators in service, all carrying approximately full load, one phase was suddenly grounded, bringing into action all the static dischargers and other safety devices in the power house, and making it necessary to trip the circuit-breakers on the exciters, and thus shut down the generators and the 26 substations supplied therefrom. The initial cause of the trouble was a "short" between the primary and secondary windings of a series transformer in one of the conductors between a generator and its oil switch. Each of these transformers, of which there are three to each generator, is placed in a brick compartment with one side open, so that if a failure occurs, there is ample room for the arc to escape. After passing the transformer, the machine cable is carried vertically through porcelain insulators in the concrete floor above and into brick compartments containing the oil switch. The force of the explosion, however, drove the arc and flame up through the insulators, thus short-circuiting the cables leading to and from the base of the oil switch. The surge of current was so great, owing to the grounding of one phase, that a number of the static dischargers on the feeder cables were overtaxed and bridged, so that it became necessary to shut down completely in order to clear up the earth connections through the safety devices. The damage in the station was of a very trifling character, but the accident has proved to the engineers of the station that 30 inches of free air space and a six-inch concrete floor are not sufficient between one of these series transformrs and the oil switch, and this distance is to be increased to eight feet.

The annual dinner of the Institution of Electrical Engineers takes place on the 22d instant, and all the delegates to the International Conference on Electrical Units and Standards have been invited.

His majesty, King Edward, has approved of the erection of electrical engineering laboratories in memory of Lord Kelvin at the Imperial College of Science and Technology, London. G.

EASTERN CANADA

Ottawa, October 17.—The Official Gazette of Ontario contains an announcement of an expected change in the charter of the Electrical Development Company of Toronto. The five per cent. dividend is to be made six per cent. cumulative. The right of the company to redeem the preferred stock at 110 and accrued dividend is canceled.

Sir James Whitney, premier of Ontario, has given out the following statement in respect to the government's electric power plans: "A contract has been entered into for the construction of the transmission lines, and a contract for electrical equipment will be let forthwith. I have every reason to believe that no delay will occur to prevent the government for carrying out the mandate it has received from the people. In order to do this we do not propose to be discouraged or prevented by technicalities."

Mr. R. L. Aitken, the electrical engineer lately appointed by the city of Toronto, in conjunction with Mr. Alex Dow of Detroit, the city consulting electrical expert, is preparing the plans for the power distribution plant for Toronto. It will be the first of the new year before the plans are completed and submitted to the Board of Control of Toronto. The plans at present being prepared are for the whole city, but the engineers have an eye open for the district that will serve their immediate purpose.

The scheme of the Robert syndicate, otherwise known as the Canadian Light and Power Company, to supply power and light to the city of Montreal, has failed. W.

NEW ENGLAND

Boston, October 17.—The American Telephone and Telegraph Company by its payment on Thursday for stock of the Western Electric Company to the par value of about $3,000,000, which it has had under option for several months, increases its holdings to about $12,000,000 out of the $15,000,000 outstanding. The transfer was on the basis, it is said, of an exchange of $250 in telephone bonds for each share of stock, so that approximately $7,500,000 in bonds was given for the $3,000,000 in stock.

The New York, New Haven and Hartford Railroad Company is reported to be negotiating for the big street-railway company of Providence and its suburbs. Theer is $8,000,000 stock involved in the proposed deal, which contemplates an exchange of preferred stock of the Rhode Island Suburban Company, owned by the New Haven, for stock of the United Traction Company of Providence share for share.

At the annual meeting of the Edison Electric Illuminating Company of Boston, C. F. Adams, 2d, was chosen to succeed Robert Bacon, who recently resigned. The latter, who was regarded as J. P. Morgan's representative on the board, has attended few meetings since he became assistant secretary of state, and Mr. Morgan some months ago disposed of most of his 3,400 shares. The other directors were re-elected.

The new 30-mile road of the Lewiston, Augusta and Waterville Railway Company in Maine was opened last Monday on an hourly schedule. The running time is two hours.

The nominal sum of $1 annually for 10 years is to be paid to the state of Massachusetts by the Boston and Northern Street Railway Company for the franchise just granted for a railway in the Middlesex fens. After 10 years a new agreement will be in order. B.

NEW YORK

New York City, October 17.—The Long Acre Electric Light and Power Company has obtained a rehearing before the Public Service Commission on its application made some months ago for permission to issue securities to the amount of $60,000,000, which the commission denied. The rehearing is believed to be preliminary to the company seeking a writ of certiorari and attacking the constitutionality of the Public Service Commission act.

Interest in the fight for transfers which is being waged by the Public Service Commission has been intensified since the commission has issued an order calling upon Frederick W. Whitridge, Federal receiver for the Third Avenue Railway, and the officials of the Central Park, North and East River Railway to restore transfers between the Third Avenue and the Ffty-ninth Street trolley lines. The order must be complied with within five days or the commission will establish a joint rate and through routes for the two companies. Efforts to show that the crosstown cars are operating at such a slight margin that a transfer arrangement would be impossible have brought out figures to show that the cash receipts have been 4.766 cents a passenger, and the cost of operation 4.456 cents a passenger, leaving a margin of only .31 of a cent of profit to the company, not counting taxes or any other fixed charges, including depreciation. If transfer passengers are included in the calculation, the company would be a loser of .063 cent on every passenger carried.

The number of serious accidents on New York transit lines has been materially decreased in the last year, according to figures given out by the Public Service Commission. The accident report for September, in comparison with the same month last year, shows the decrease in the number killed was 29, or almost half of the number killed in September, 1907. Contact electricity caused only 39 accidents out of the total of 5,023 recorded during the last month.

Reorganization of the Hudson River Power Company has been undertaken since it defaulted on its August 1st interest. There are eight subsidiary companies, and one of these defaulted on its interest October 1st. The list includes the Hudson River Electric Power, the Hudson River Water Power, the Hudson River Electric, the Saratoga, the Ballston Spa, the Empire State, the Madison County and the Hudson River Power Transmission companies. There are about $11,000,000 bonds outstanding. The company furnishes the General Electric works at Schenectady with a large percentage of the electric power used. It also provides electricity for railways carrying, it is estimated, about 80,000,000 passengers annually in the large cities of its territory, including Albany, Troy and others. The authorized capital is $10,000,000.

The plans of the Erie Railroad for the electrification of its suburban lines, which have been under discussion for the last four years, are not to be carried out in the near future to any great extent, an official of the road has announced, than that the 32 miles to Suffern, about 15 per cent. of the total electrification work planned, will probably be begun within a few months. Upon the success of this first section of electrification will depend the future plans of the road for this work. It is denied that Mr. Harriman has pledged $14,000,000 for the work of electrification. It was pointed out that it would probably take five years to complete the work, and that this $14,000,000 estimate, made four years ago, was for the electrification of the entire 220 miles upon which the Erie proposes eventually to substitute electricity for steam. W.

SOUTHEASTERN STATES

Charlotte, N. C., October 17.—Representatives of the Birmingham Railway, Light and Power Company, the Southern Bell Telephone Company and the People's Telephone Company, Mayor G. B. Ward, the street commissioners and the city engineer of Birmingham, Ala., held an important conference this week to discuss the question of placing all wires underground. As a result it is expected that the work will be started as soon as practicable, the representatives of the various electric interests showing a disposition to act favorably on the movement started by the city.

The Electric Installation Company is opening up as a new contracting firm at the corner of Calvert and Franklin streets in Baltimore with a complete equipment. A. M. Berger is manager and L. F. Kries superintendent. The new company will give demonstrations of artistic lighting and the practical uses of electrical devices.

The Talley's Falls Improvement Company will soon begin the development of a waterpower on the Dan River, five miles south of Scottsburg, Va., to cost about $1,000,000. The financing of the company is assured by pledges of New York capitalists, and with the 12,000 horsepower estimated to be available the company will supply a large amount of power as far distant as Henderson, N. C. It is said that electric power will be largely used by the copper mines in the Virginia and Carolina "copper belt." The supply of power at a reduction of about 30 per cent. under the present cost will not only facilitate the work of the mining interests but will make it possible to mine ores with profit where heretofore the cost of power has rendered operations in many places unprofitable.

An electric railway for local service is being agitated at High Point, N. C.

The Sumter (S. C.) Telephone Company has contracted with the Bell company for long-distance connections for Sumter telephone patrons.

D. H. L.

OHIO

Toledo, October 17.—There seems to be a slight improvement in business, so far as the wholesale electrical suply houses are concerned. Business throughout the country is becoming more active, inquiries are more numerous and actual sales are increasing in volume somewhat, although the change is coming on very gradually. Locally there is but little actual betterment, but there are many encouraging indications which point to good prospects for the future. A number of important structures are now being projected, but it is doubtful if the work will proceed this fall to such an extent as to be of material benefit to electricians. Repair work seems to be quite plentiful, and altogether there is a feeling of optimism which will undoubtedly goes a long way toward restoring better conditions.

L. E. Beilstein, general manager, Herman S. Swift, secretary and auditor, and C. R. McKay, manager of the light and power department, all of the Toledo Railways and Light Company, went to Atlantic City this week to attend the annual meeting of the American Street and Interurban Railway Association.

Mr. A. H. Ahlm, retained to draft plans for the new proposed municipal lighting plant at Lima, Ohio, estimates that the city can produce lights at less than $50, as against $57.50, offered by the Schoepf syndicate. The city is now paying $80 per arc.

A. E. Williams of Columbus has been appointed assistant superintendent of the Ohio electric lines at Springfield. He succeeds E. J. Egolf, who is transferred to the eastern division. The latter will take a brief rest before assuming his new duties.

H. L. S.

ILLINOIS

Peoria, October 17.—Bids for the construction of the Illinois Traction Company's bridge across the Mississippi have been opened, but no figures have been given out, all having been referred to President McKinley. Work on the superstructure will be commenced by the first of the year, and it is expected it will take a year to complete the work.

The contract for the building of the street railway at Taylorville has been let to the Chicago Installation Company for $61,800. This includes the overhead equipment and the construction of the railway. The power house is under course of construction and will be finished in two weeks. The contract for the machinery for the power house and the cars will be let next week. The railway will run from the paper mill to the mine of the Christian County Coal Company, a distance of four miles, running through the best part of the city of Taylorville The company is incorporated for $150,000, with W. B. Adams as the leading spirit.

A petition from the John Brinkerhoff Company is before the City Council at Springfield asking for an extension of time for the forfeiture of the $5,000 bond that the company has up to be selling current by the first of next February. Up to the present time the company has failed to comply with the conditions of the ordinance, and is asking time on account of the financial stringency.

V. N.

INDIANA

Indianapolis, October 17.—Interest has been revived in the construction of the proposed Fort Wayne and South Bend Traction line. The promoters say that the interurban people are learning by experience that it is better to keep from steam lines that parallel trunk lines. For this reason a new route has been decided upon, which will be of greater advantage to isolated communities. Work on the new line is to be begun in the spring.

The Board of Public Works of Elkhart has granted a 50-year franchise to the St. Joseph Valley Traction Company to build and operate tracks in certain streets, work to be begun within 30 days.

The townships of Carrollton and Washington in Carroll County have voted subsidies of $10,000 each in aid of the construction of the Logansport and Frankfort Traction Company, with headquarters in Frankfort. W. E. Moser of Cleveland, one of the promoters, says that the company will enter upon the work of constructing the line at once. No part of the subsidy is to be paid until the road is completed and running cars between the two principal points.

The Indiana Lighting Company of New York has filed with the Madison County recorder at Anderson a mortgage of $5,000,000. It is said that the mortgage is to cover an issue of 5,000 bonds, payable August 1, 1958. The mortgage covers lighting plants and gas properties at Fort Wayne, Lafayette, Logansport, Peru, Lebanon, Frankfort, Bluffton and Alexandria.

Old and abandoned gas wells in the Hamilton County and Henry County districts are being cleaned out and returned to life. These wells are now producing gas at a pressure of 90 pounds. Several new gas wells brought in near Richmond show an abundance of natural gas, and assurances are given that the patrons will have adequate supply for the winter.

S. S.

NORTHWESTERN STATES

Minneapolis, October 17.—A 25-year franchise for the Clinton Street Railway Company will be voted on by the people of Clinton, Iowa, on November 3d.

The Des Moines (Iowa) Edison Light Company, hereafter to be known as the Des Moines Electric Company, will expend $1,000,000 for the extension of the plant.

On November 3d the voters of Iowa City, Iowa, will pass upon the granting of a franchise for the construction and operation of a street-car system.

The contract for the electric railway between Sioux City and Spirit Lake, Iowa, has been let to Westinghouse, Church, Kerr & Co.

A proposition to install an electric-lighting plant at Buffalo, Minn., is to be voted on.

The village of Deer River, Minn., has granted a 20-year franchise for lighting the city with electric lights to W. A. Overton. The village will have the privilege of purchasing the plant after 10 years.

The Polar Star Electric Company of Faribault, Minn., has redeemed $30,000 bonds and satisfied judgments held against it, and will expend $150,000 in improvements during the next month. It is believed that the Northern Heating and Electric Company of St. Paul is back of the deal.

A deal has been perfected at Nevada, Iowa, whereby the Nevada Mutual, Roland Mutual, Cambridge Independent, Maxwell and Short Line telephone companies are merged under the title of the Story County Independent Telephone Company, with headquarters at Nevada. F. M. Boardman, manager of the Nevada Mutual, will be at the head of the new concern.

The North Dakota Independent Telephone Association will hold its next meeting in Devils Lake, N. D.

The Tri-State Telephone Company has opened a new branch exchange in Minneapolis in the Lake Harriet district, taking the name of "Harriet," and having 1,000 lines. Another branch will soon be opened at Sixth Street and Sixth Avenue Southeast.

The Interstate Telephone Company of Dubuque, Iowa, has signed a contract with the Bell company for toll connections in Dubuque.

The contract for the erection of a telephone exchange at Eldora, Iowa, was let to F. X. White for $4,760.

R.

WESTERN CANADA

Winnipeg, October 17.—Interesting complications are expected in the street-railway situation in Port Arthur and Fort William about November 1st. The new joint board of members from both cities has sent notices to all employes that their services will not be required after that date, when a new secretary-treasurer and a new manager will take charge. In the meantime the Port Arthur commissioners, who have been operating the line, have issued instructions to the employes of the system to take orders from no one but themselves. Hence in November it appears there will be two sets of officials and employes for the one line.

The City Council of St. Boniface, Man., is preparing by-laws to provide for the establishment of municipal gas and electric-light and power plants. At present these commodities are supplied by the Winnipeg Electric Company of Winnipeg. Address Theodore Bertrand, mayor.

The first street cars for the municipal system at Edmonton, Alb., have arrived. They were manufactured at Ottawa, Ont., by the Ottawa Car Company.

Work on the waterpower development at Fort Francis, Ont., has been taken up again. J. J. Wood & Co., New York, have the contract for the completion of the dam and the construction of the power plant.

Telephones, Ltd., is the name of a new company formed, with head office at Cranbrook, B. C., and a capital of $200,000. It will do a general telephone business throughout the Kootenay country and has taken over the plant and franchises of the Cranbrook Telephone Company. At Fernie there is strong opposition to granting a franchise to the new company for the installation of a local system. A number of the ratepayers are in favor of a municipally owned and operated system.

Lieutenant Jeunet, in charge of government wireless telegraph stations in Alaska, has returned from the North. He reports that all the wireless stations are now open for commercial business. There are stations at Circle, Eagle, Fairbanks, Gibbon and Nome, and the system seems a marked success.

The ratepayers of Port Arthur, Ont., have voted in favor of spending $97,000 for power development, $32,000 for electric lighting extensions, $7,000 for street-railway work and $25,000 for extensions to the telephone system. Address J. J. Carrick for information.

R.

PACIFIC SLOPE

San Francisco, October 14.—Another step in the consolidation of the holdings of the Northern California Power Company was taken last Monday, at a meeting of the stockholders of the company, at which 94,780 shares of the stock were represented. It was unanimously resolved to transfer all the property of the company to the Northern California Power Company, Consolidated, which has been organized with a capital of $10,000,000, in 100,000 shares. The shareholders of the Northern California Power Company will receive one share of stock in the new company for each share they now hold. The next step will be to finance a large amount of additional installation. For this purpose the stockholders will meet on November 11th to authorize a bonded indebtedness of $10,000,000, which will retire the present bonded indebtedness of all the subsidiary companies, and provide ample money for the contemplated extensions.

The Oakland Gas, Light and Heat Company has just completed the foundations for a new electric-lighting plant, which, with the newly completed $200,000 gas retainer, will provide the city of Oakland with one of the most efficient gas and electric plants on the Coast. The new electric plant will contain a steam-turbine generator with a capacity of 12,000 horsepower.

The installation of the electric-laboratory outfit of the San Jose High School, at a cost of $15,000, has recently been completed.

The fine five-story reinforced-concrete building of the John A. Roebling's Sons Comapny at the corner of Folsom and Hawthorne streets, is now about complete, and most of the stock has been moved in. The new offices will be occuiped in a few days.

Henry F. Frosch, of Henry F. Frosch & Co., has just returned from Chicago. The company, which represents the Federal Electric Company, the General Incandescent Lamp Company, the Excello Arc Lamp Company, the Vulcan Electric Heating Company, the Crescent Company and the Minerallac Company, has occupied new quarters at 111-113 New Montgomery Street.

A rejuvenation of the Sons of Jove was held at Solari's cafe in San Francisco on October 10th. Eighteen new members were admitted.

Between $2,500,000 and $3,000,000 is to be spent on construction of a power line from Thompson, Mont., to Murray, Idaho. The project has been for some time in the hands of Senator Bonlan of Missoula, Mont. The line will be about 31 miles in length, and will furnish power for mines.

The Portland Railway, Light and Power Company has secured a franchise for an electric-lighting system in property outside and adjacent to Vancouver, Wash.

The Washington Waterpower Company of Spokane, Wash., has awarded to the I. P. Morris Company of Philadelphia a contract for the installation of a set of waterwheels which, with one exception, will be the largest and most powerful in the United States. The set consists of four wheels, each weighing 650,000 pounds and having a capacity of 9,000 horsepower, with a head of water of 68 feet. The plant will be built on the Spokane River, 15 miles west of Spokane, to furnish electric light and power for towns in the vicinity.

The LaGrange Water and Power Company, which was recently granted the privilege of constructing lines in Eastern Stanislaus County, has secured a franchise for furnishing the city of Turlock, Cal., with electric light, heat and power, and will at once begin work on the necessary transmission system. The system is to be completed within six months.

Hall Bros. have made an offer to supply the town of Newport, Ore., with an electric-lighting system, or with power for operating a plant, and the City Council has appointed a committee to consider the matter.

Within 30 days the Seattle, Renton and Southern Railway will begin the construction of a new power house at Columbia City, Wash, to furnish power needed to increase the car service between Columbia City and Renton. The plant will furnish 660 horsepower.

The Central Arizona Electric Company has been incorporated at Prescott, Ariz., with a capital stock of $200,000, by J. E. Russel and E. S. Clark.
A.

PERSONAL

Mr. C. W. Lee of the C. W. Lee Company of New York, experts in public-service publicity campaigns, was in Chicago this week.

Mr. Robert Howes has opened an office as consulting engineer in hydro-electric work in the American Bank Building, Seattle, Wash.

Mr. Clement C. Smith, well known among electric-railway men, has been elected president of the Wisconsin Electric Railway Company of Oshkosh, Wis.

Mr. B. A. Behrend, for nearly 10 years chief engineer of the Bullock Electric Manufacturing Company, and for five years chief engineer of the electrical department of Allis-Chalmers Company, has resigned from that company.

Mr. Charles A. S. Howlett of the Western Electric Company, president of the Electric Club of Chicago, was one of the fortunate ones winning a farm in the Rosebud allotment of Tripp County lands at Dallas, S. D., this week.

Mr. James G. Nellis, who has been superintendent of the Adirondack Lakes Traction Company, has been transferred to Amsterdam, N. Y., where he will be assistant to Superintendent Julian DuBois of the Amsterdam division of the F. J. and G. road.

Mr. E. K. Stewart, general manager of the Columbus Railway and Light Company, is largely interested in oil wells in West Virginia, Kansas and Oklahoma, and is now in the latter state looking over his property as well as some new lands which can be leased.

Mr. Alex Dow, vice-president and general manager of the Edison Illuminating Company of Detroit, Mich., has been tendered the position of advising electrical expert during the erection of the new municipal electric-light and power plant at Toronto, Canada.

Mr. L. C. Fischer of Danville, general manager of the Illinois Traction Company, was in attendance at the annual convention of the American Street and Interurban Railway Association at Atlantic City, as were also Messrs. A. C. Murray of Peoria and J. M. Bosenbury of Springfield, representing the same company.

Mr. G. B. Perham, district manager for the Northwestern Telephone Exchange Company at Fargo, N. D., has resigned. He will be succeeded by Mr. Thomas H. Hillary of Stillwater, Minn., who has been district manager there for the company. Mr. C. P. Donnellan, who has been local manager at Stillwater, will succeed Mr. Hillary there.

Mr. Charles A. Coffin of New York, president of the General Electric Company, and Mr. E. Thurnauer of Paris, managing director of the French Thomson-Houston Company, were visitors in Chicago last Saturday. They were the guests of Mr. Samuel Insull, president of the Commonwealth Edison Company, and inspected the Fisk Street and Quarry Street stations.

Mr. R. W. Reynolds, formerly superintendent of the Terre Haute, Indianapolis and Eastern Traction Company, has resigned that position to become general superintendent of the Chicago, South Bend and Northern Indiana Railway Company, with offices at South Bend, Ind. Mr. Reynolds has been connected with the traction line since the completion of the Indianapolis and Northwestern, which was absorbed by the T. H., I. and E. Traction Company several years ago.

Mr. H. P. James, formerly electrical engineer of the Bryant Electric Company, now occupies the position of sales manager for the new line of push-button specialties recently placed on the market by the Cutler-Hammer Manufacturing Company of Milwaukee. Mr. James is a graduate of the Massachusetts Institute of Technology, where he received degrees in both electrical and mechanical engineering. Previous to his connection with the Bryant company, he was electrical inspector and engineer for the Associated Factory Mutual Fire Insurance Companies. In his present position he will have opportunity to turn to practical account the result of his experience in the inspection, testing and manufacture of electric-lighting supplies.

ELECTRIC LIGHTING

Temple, Tex., contemplates installing a municipal light plant.

The McCook (Neb.) Electric Company has been incorporated with a capital stock of $100,000.

The Sutton (Neb.) Electric Light and Power Company has been incorporated with a capital stock of $25,000.

The Edmonds (Wash.) Electric Light and Power Company has been incorporated with a capital stock of $20,000.

Sunnyside, Wash., has granted a franchise for an electric-light and water plant to Robert E. Cavette of Spokane, Wash.

The capital stock of the Hillsboro (Ill.) Electric Light and Power Company has been increased from $50,000 to $100,000 and the name changed to the Union Electric Company.

The Las Cruces (N. M.) Light and Power Company has purchased a 225-horsepower Corliss engine and a quantity of copper wire and poles for extensions planned during the coming year.

The Rockford (Ill.) Electric Company has closed a contract with a concrete construction company for the erection of a new power house. All of the turbines will be reset in new pits; the race channel will be deepened, and the tail-race and gates will be entirely rebuilt of concrete. The cost of the new improvements will closely approximate $40,000.

The Momence (Ill.) electric-light plant has been destroyed by fire, "putting the city on the kerosene circuit for the present," writes the local correspondent of the Hoopestown Herald. The franchise of the company operating the plant expires next March, and as a franchise has been granted another company it is not thought probable that the old company will rebuild.

ELECTRIC RAILWAYS

There is a probability of an electric railway within a year from Peoria to Rock Island, Ill., paralleling the Chicago, Rock Island and Pacific Railroad.

The Denver (Colo.) Interurban Railway and Construction Company has opened offices at Greeley, and when the $700,000 necessary to complete the financing of its road is secured it is the intention after building a direct road from Greeley to Denver to build branch lines into all the farming districts, with Greeley as a center.

The shops of the Indiana Union Traction Company in Anderson will house 311 cars, and 81 men are now regularly employed in the various departments. The tool equipment of the shops is said to be the most complete in the country. The buildings are illuminated by Cooper Hewitt mercury-vapor lamps mounted on the roof trusses to secure maximum diffusion.

The Wisconsin Electric Railway Company has elected C. C. Smith, president; R. T. Gunn, general manager; J. P. Pulliam, superintendent, and W. J. Kelsh, master mechanic. The capital stock of the new company is placed at $350,000, with a bond issue of $783,000. Most of these officers hold similar positions with the Eastern Wisconsin Railway and Light Company.

The Public Service Commission for the Second District of the State of New York is holding inquiries at which the steam railroads operating in the forest lands have been called upon to show cause why some other method than steam should not be used in operating trains through the forests. It is said that electricity could be generated at a low price for use in the operation of trains through the mountains.

The Indiana Union Traction Company, after severe tests of the electric locomotive recently built in its own shops, has decided that this motive power is a success for hauling trains, and will build another locomotive similar to the one that has been running for the last month. It is probable that during the coming year a number will be built. Work is now progressing on the second one in the Anderson shops. This will be put into passenger service as well as for other heavy hauling and will have a capacity for hauling eight interurban passenger cars.

The construction of the Hiteman extension of the Albia (Iowa) Interurban Railway Company is well under way, the financing having been recently completed. In the course of the Hiteman extension to the Albia-Hocking line the Albia Electric Light and Power Company's property was purchased and remodeled. The capital stock, $250,000, and $125,000 of the $160,000 bond issue, have been placed by the Engineering Construction and Securities Company, 171 La Salle Street, Chicago, which has the contract for financing and construction. Messrs. C. B. Judd and C. A. Ross have had charge of the engineering work involved.

POWER TRANSMISSION

The People's Gas and Electric Company of Savanna, Ill., has proposed to furnish power for pumping the city water for $225 a month. The Town Board has taken 30 days to consider the proposition.

The La Grange Water and Power Company has secured a franchise to build an electric lighting and power system at Turloch, Cal., and will construct a power transmission line in the eastern part of Stanislaus County.

Promoters at Cedar Rapids, Iowa, have filed an application for a franchise to build a dam across the Cedar River at Palisades, a few miles below the former city. It is estimated that 5,000 horsepower will be developed.

Along with the expenditure of $2,500,000 for rebuilding and enlarging Brighton Beach, a summer resort near New York city, four 61-ton Snee wave motors are to be installed for lighting, heating and power purposes. A steel-reinforced concrete pier will be built out into the ocean, establishing a promenade 100 feet in width, at the outer end of which the turbines will be installed.

The Continental Mines, Power and Reduction Company has completed a hydro-electric water and power transmission plant at Yankee, Colo., and will supply mines and mills in Clear Creek County. The waterpower is obtained from impounding the waters of River Fall River, Cumberland and Silver creeks. The three streams are united and carried through an 8,000-foot flume. From the penstock to the power house there is a fall of 550 feet.

TELEPHONE

The Spivey (Kan.) Telephone Company has been incorporated with a capital stock of $10,000.

The El Dorado (Okla.) Telephone Company has been incorporated with a capital stock of $50,000.

At Coffeyville, Kan., the Perkins Telephone Company has been incorporated with a capital stock of $10,000.

PUBLICATIONS

"Keep your seat!" is the appropriate title on a mailing card calling attention to Burns' extensible telephone bracket, sent out by the American Electric Telephone Company, Chicago, Ill. The device is attached to the desk and holds the telephone instrument in the position wanted.

October "Paistery," the house publication of the H. T. Paiste Company, Philadelphia, illustrates some useful molding sockets and rosettes, together with several new designs in panel cut-outs for snap switches. Aleck's inevitable "blackboard talk" demonstrates the useful quality of Paiste cross-over insulators in open wiring, taking the place of tubes or loom.

The Central Electric Company of Chicago is distributing new price-lists on Columbia low-voltage tungsten miniature lamps for battery service. The introduction of such lamps is of great importance to those having occasion to use battery lamps, and in anticipation of the demand, the company has accumulated a heavy Chicago stock. These price-lists will be sent to any address upon application to the company.

"The Modification of Illinois Coal by Low Temperature Distillation" is the title and Profs. S. W. Parr and C. K. Francis are the authors of Bulletin No. 24 of the engineering experiment station of the University of Illinois. These experiments describe an attempt to remove from bituminous coals the heavy hydro-carbons and to produce a fuel essentially smokeless. Copies of the bulletin may be obtained gratis upon application to the director, engineering experiment station, Urbana, Ill.

In Bulletin No. 4621, just issued by the General Electric Company, Schenectady, N. Y., there is illustrated and described its luminous arc lamp for multiple circuits. One form of this lamp is intended primarily for use in foundries, machine shops, freight houses, etc., where a large unit is desired that combines high efficiency with low maintenance cost. The lamp is made for 110 and 220-volt direct-current circuits, but is suitable for a considerable range of voltage on either side of the standard. There has also been designed a multiple luminous-arc lamp for use on direct-current power circuits and also for use as a headlight on interurban cars and mining locomotives. Another recent publication of this company is circular No. 3702, which describes the new Type CR feeder regulator and the benefits to be derived from the use of this apparatus in connection with alternating-current lighting systems. This regulator is designed for operation on single-phase, 220-volt, 60-cycle circuits, and may be used with either hand or sprocket control. Circular No. 3705 is devoted to the new 25-watt tantalum lamps that have recently been put on the market.

Much useful information for users of mica insulation is contained in the new catalogue, "Electrical Insulating Materials," just issued, which lists the numerous and varied insulating products of the Mica Insulator Company, 68 Church Street, New York city. This company manufactures micanite, Empire cloths and papers, linotape, M. I. C. compound, linolac and other insulators, available in many different forms. The present catalogue, No. 25, is complete with the code name, description and list price of these various products. Micanite, the registered trade name of the mica products of the company, though thought by many engineers to cover all manufactured mica insulating materials, can be obtained in a variety of forms. These include micanite plate for molding rings and commutator segments, flexible micanite, micanite cloth, paper, and paper tape, pressboard and mica rope paper and mica and micanite washers, tubing, and armature insulation troughs for railway motors. Linotape is an insulating tape covered with coatings of Empire oxidized linseed oil. M. I. C. compound and linolac are black and light colored insulating varnishes, respectively.

SOCIETIES AND SCHOOLS

On October 29th the Western Society of Engineers will give a smoker and housewarming in its recently enlarged quarters on the seventeenth floor of the Monadnock Block, Chicago.

The Worcester Polytechnic Institute branch of the American Institute of Electrical Engineers has 74 members, divided as follows: Professors and instructors, 8; post graduates, 9; seniors, 23; juniors, 22; sophomores, 11, and freshmen, 1.

The November meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, New York city, on November 10th. Mr. Franklin Phillips, president of the Hewes & Phillips Iron Works, Newark, N. J., will make an address on "The High-powered Rifle and Its Ammunition—Instruments of Precision," to be illustrated by lantern slides.

The lecture by Prof. C. F. Burgess on "Electrolytic Corrosion of Boiler Tubes," announced for the meeting on November 13th of the electrical section of the Western Society of Engineers, has been postponed, and in place thereof Mr. J. M. S. Waring, Chicago engineer for the Electric Storage Battery Company, will present a paper on "The Application of Storage Batteries to Alternating-current Circuits."

TRADE NEWS

Sealed proposals will be received at the office of the supervising architect, Washington, D. C., until November 11th, for the extension and remodeling of the Federal building at Newbern, N. C., in accordance with the specifications, which may be had at the above office or at the office of the custodian at Newbern.

Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until November 16th for the construction (complete) of the postoffice buildings at the following places: Iola, Kan.; Crookston, Minn.; Rawlins, Wyo.; Baker City, Ore., and Trinidad, Colo. Specifications may be obtained at the above office or from the custodians of the respective sites.

BUSINESS

The G. M. McKelvy Company of Youngstown, Ohio, has placed an order with the Nernst Lamp Company for the new Westinghouse Nernst lamps for the entire lighting of its new four-story store building, to be occupied this month. The installation will consist of 36 three-glower lamps for the first floor, 69 two-glower lamps for the second and third floors and seventy-five 132-watt lamps for the basement and fourth floor.

The Stave Electrical Company's removal from 1 Madison Avenue to 27 West Twenty-seventh Street, New York, where factory and office are combined in one building, makes possible more prompt service to customers by centralizing the different departments. Larger premises were necessary to handle efficiently the company's increasing flaming-arc-lamp business before the lighting season was further advanced. Stave flaming-arc lamps are proving especially successful in large works, foundries, etc. In the attractive showroom the Stave Electrical Company has erected, the high candlepower and low current consumption of the lamps will be demonstrated. The Stave Electrical Company is also exhibiting the "Stavelco" semi-enclosed arc, a lamp of high efficiency and color-true light. This lamp should be of interest for dry-goods stores, tailor shops and any places where the light is required to be as nearly as possible the same as daylight.

DATES AHEAD

Illinois State Electric Association (annual convention), Illinois Hotel, Bloomington, October 27th and 28th.

American Electrochemical Society (fall meeting), New York city, October 30th and 31st.

Association of Car Lighting Engineers (first annual convention), Chicago, November 16th to 21st.

Chicago Electrical Show (fourth annual), Coliseum, January 11th to 23d, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) October 13, 1908

900,693. Circuit-breaker. Charles C. Badeau, Schenectady, N. Y., assignor to the General Electric Company. Application filed September 16, 1901.

This circuit-breaker has a main toggle and an auxiliary toggle connected in tandem, one of the toggles being slightly underset and the other slightly overset when the contacts are in engagement. (See cut on next page.)

900,699. Circuit Controller. Alexander Bevan, Providence, R. I. Application filed September 16, 1907.

A quick-acting switch is provided with a lever operating an insulated circuit-closer and an inertia bumper arranged to yield and absorb the excess motion of the lever when struck by the same, whereby rebound is prevented.

900,708. High-tension Circuit-breaker. Fred B. Corey, Schenectady, N. Y., assignor to the General Electric Company. Application filed February 19, 1903.

The stationary and movable contacts have connected plates of magnetic material located on opposite sides thereof, and sheets of insulation secured to the inner surfaces of the plates and to which the contacts are secured.

900,709. Arc Lamp. James A. Dalzell and Charles E. Harthan, Lynn, Mass., assignors to the General Electric Company. Application filed February 11, 1904.

This patent covers details of a clutch and a gas cap for arc lamps.

900,710. Means for Supporting Collector Rings. William F. Dawson, Rugby, England, assignor to the General Electric Company. Application filed February 20, 1907.

To the inside of the collector ring are secured insulated cup-shaped supports that fit on their open ends against the shaft.

900,718. Arc Lamp. Richard Fleming and Cromwell A. B. Halvorson, Jr., Lynn, Mass., assignors to the General Electric Company. Application filed May 1, 1905.

The construction of a draft tube and a shield for the copper electrode of a luminous arc lamp is described.

900,719. Adjustable Support for Vapor Lamps. Stanwood E. Flichtner, Englewood, N. J., assignor to the Cooper Hewitt Electric Company, New York, N. Y. Original application filed July 28, 1904. Divided and this application filed January 9, 1905.

Behind the luminous part of the lamp is a curved reflecting guide.

900,730. Brush-holder. Harry E. Heath, Lynn, Mass., assignor to the General Electric Company. Application filed April 7, 1904.

The brush-holder has a supporting frame free to rock about an axis substantially coincident with a line in the face of the brush.

900,732. Electrically Heated Curling Iron. Harry Hertzberg and Maurice J. Wohl, New York, N. Y., assignors to the Economy Electric Company, Brooklyn, N. Y. Application filed April 18, 1907.

In one limb of the iron is a resistance pencil incased by a metallic tube acting as the return conductor.

900,733. Electric Lighting. Peter C. Hewitt, New York, N. Y., assignor to the Cooper Hewitt Electric Company. Application filed April 5, 1900. Renewed April 15, 1908.

A number of vapor lamps requiring a starting current of higher potential than that required for regular operation are provided with a common reactance in the circuit.

900,743. Relay. Isidor Kitsee, Philadelphia, Pa. Application filed October 19, 1907.

Means to adjust a cable relay comprise mechanical means to normally connect the relaying contacts and electrical means to lessen the pressure of the contacts.

900,745. System of Electrical Distribution. Osias O. Kruh, Schenectady, N. Y., assignor to the General Electric Company. Application filed September 15, 1905. Renewed March 6, 1908.

This is a method of connecting mercury-vapor rectifiers to a system through a series of reactances.

900,752. Controlling Means for Air Brakes. George Macloskie, Schenectady, N. Y., assignor to the General Electric Company. Application filed March 5, 1908.

A single operating lever actuates combined means for moving a valve that controls the brakes pneumatically and a switch that controls them electrically.

900,755. Automatic Means for Controlling Movements of Gun-rammers. John F. Meigs and Robert P. Stout, South Bethlehem, Pa., assignors to the Bethlehem Steel Company, South Bethlehem, Pa. Application filed May 22, 1907.

The rammer is motor-driven, the two motors being automatically controlled.

900,771. Armature for Unipolar Machines. Jakob E. Noeggerath, Schenectady, N. Y., assignor to the General Electric Company. Application filed April 25, 1907.

There are two sets of collector rings, and armature conductors between the sets of rings and connected thereto, each conductor being divided at a point near its center into separable parts.

900,773. Electric Plug Receptacle. George L. Patterson, New York, N. Y., assignor to Alice C. Patterson, New York, N. Y. Application filed October 8, 1907.

A box has a cover with an opening for admitting a plug and a hinged closure for the opening.

900,776. Composite Locomotive. Charles A. Pratt, Chicago, Ill., assignor to the Goodman Manufacturing Company, Chicago, Ill. Application filed December 17, 1906.

A mining locomotive is provided with separate but connected motor and brake units.

900,777. Prepayment Meter. William H. Pratt, Lynn, Mass., assignor to the General Electric Company. Application filed April 10, 1905.

In this meter there is a movable coin-chute, which closes a switch when its position is changed by the entrance of a coin.

900,780 and 900,781. Dynamo-electric Machine. Henry G. Reist, Schenectady, N. Y., assignor to the General Electric Company. Applications filed June 20, 1904, and March 1, 1905.

The first patent relates to the construction of the revolving field and the second to the construction of collector rings that have both external and internal cylindrical contact surfaces.

900,786. Two-button Switch. Frank W. Sanford, Schenectady, N. Y., assignor to the General Electric Company. Application filed October 2, 1905.

A reversing snap switch is described.

900,793. Arc Lamp. George E. Stevens, Lynn, Mass., assignor to the General Electric Company. Application filed September 27, 1906.

The frame of this lamp is composed of a backbone made of a rod bent into the form of a yoke having depending legs, a sheet-metal hood having holes through which the legs pass, and a platform carried upon the legs.

900,798. Sparking Device for Gas Engines and the Like. Fredus A. Thurston, Chicago, Ill. Application filed June 15, 1904.

A current-distributing device consists of a stationary and a movable armature provided with co-operating contacts.

900,830. Apparatus for Neutralizing Static Electricity. William H. Chapman, Portland, Me. Application filed January 23, 1908.

In this apparatus there is a hollow perforated cylindrical conductor connected to earth and an electrically charged insulated wire secured to the axis of th conductor.

900,839. Rotor Construction. Bernard Elshoff, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed September 7, 1906.

At each end of the core of this dynamo-electric machine is an end cover. Wedges force the end turns of the coils against the cover.

900,847. Process of Plating Metallic Bodies. George A. Goodson, Minneapolis, Minn. Application filed March 28, 1906.

The process consists in subjecting lead to an electric current while in a molten condition, allowing the lead to solidify, subsequently remelting it and applying it to the metallic body to be plated.

900,854. Means for Locking Electric Sockets to Fixtures. Harvey Hubbell, Bridgeport, Conn. Application filed March 16, 1907.

A socket shell has a coupling device permanently secured thereto and comprising a two-wing bushing internally threaded to receive a threaded end of a fixture.

900,884. Automatically Adjustable Brush-holder. Walter J. Richards, Milwaukee, Wis., assignor to Allis-Chalmers Company. Application filed September 10, 1900.

Pivoted to a stud is a frame to which is pivoted the brush-holder for a limited movement in either direction as the rotation of the motor is reversed.

900,898. Electric Accumulator. Molière C. Thiellet and Marius J. Denard, Lyon, France. Application filed April 3, 1907.

One electrode comprises in combination with oxide of lead, gelatine gelatinized in aqueous bichromate of potash, and asbestos fiber emulsified in sulphuric acid and silicate of soda.

900,909. Electric Glow Lamp, etc. Fritz Blau and Hermann Remané, Berlin, Germany, assignors to Deutsche Gasglühlicht Aktiengesellschaft (Auergesellschaft), Berlin, Germany. Application filed April 25, 1906.

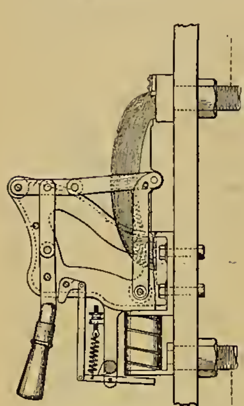
A metallic-filament lamp is made by providing within the bulb of the lamp a deposit similar to that which in a vapor of hydrogen the electric current passing through the incandescent body tends to produce, and then exhausting the bulb.

900,917. Insulator. Grant Dobson, Pittsburg, Pa., assignor of one-half to Richard A. Ohloff, Pittsburg, Pa. Application filed April 1, 1908.

A supporting stem is provided with an insulating block having a groove and a ring of insulating material surrounding the stem and arranged to engage the wire when inserted in the block.

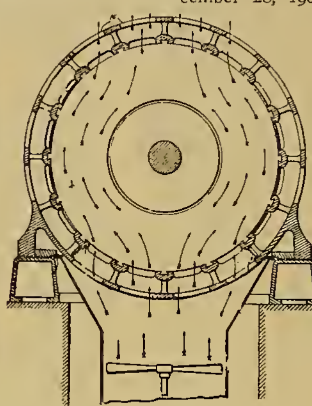
900,926. Electrolytic Apparatus for Purifying Liquids. John T. Harris, New York, N. Y. Continuation of application filed June 20, 1903. This application filed November 20, 1906.

The apparatus comprises a vessel, a magnetized anode of a material which will yield a coagulant, a cathode,

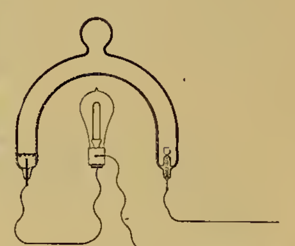


No. 900,693.—CIRCUIT-BREAKER

No. 900,929.—PILE PROTECTOR



No. 900,977.—ALTERNATOR VENTILATION



No. 901,294.—LIGHTING SYSTEM

and means for separating the impurities from the treated liquid.

900,929. Pile Protector. William Howe, Seattle, Wash. Application filed January 28, 1907.

In a teredo destroyer segmental electrodes are applied to the pile and insulated from the surrounding water, the saturated pile forming an electric conductor between the electrodes. (See cut.)

900,958. Safety Appliance for Electric Railways. Robert K. Richardson, Brooklyn, N. Y., assignor of 40 one-hundredths to John D. Gunther and 10 one-hundredths to Henry Perkins, Brooklyn, N. Y. Application filed September 21, 1907.

Protecting shields are provided for a third rail that are hinged to the insulating supports and insulated from the rails in such a way that the contact plow opens the shields successively in passing from section to section.

900,961. Production of Magnesium by Electrolysis. George O. Seward and Franz von Kügelgen, Holcombs Rock, Va., assignors to the Virginia Laboratory Company, New York, N. Y. Application filed October 10, 1905.

The process consists in fusing together magnesium-fluoride and calcium chloride with a flux of an alkali fluoride, heating to render the bath anhydrous and then electrolyzing to produce magnesium.

900,962. Production of Barium and Barium Alloys. George O. Seward and Franz von Kügelgen, Holcombs Rock, Va., assignors to the Virginia Laboratory Company, New York, N. Y. Application filed March 28, 1906.

This process consists in electrolyzing fused barium chloride with the addition of barium fluoride.

900,977. Dynamo-electric Machine. Bernard A. Behrend, Norwood, Ohio, assignor to Allis-Chalmers Company and the Bullock Electric Manufacturing Company. Application filed March 26, 1906.

Ventilation of a turbo-alternator is provided by having air forced in at the bottom, passing upward through the machine and out at the top. (See cut.)

901,012. Electric Battery. Isidor Kitsee, Philadelphia, Pa. Application filed October 15, 1906.

The method of depolarizing an electrode provided with platinum black consists in impinging a jet of air thereon when out of contact with the electrolyte, whereby continued catalytic action of the platinum black is permitted.

901,013. Galvanometer. Louie E. Knott, Boston, Mass., assignor to the L. E. Knott Apparatus Company, Boston, Mass. Application filed November 24, 1906.

The mounting of the moving coil of a D'Arsonval reflecting galvanometer is described.

901,027. Safety Guard for Trolley Wheels. Frank J. Nolan, Buffalo, N. Y., assignor to the Automatic Trolley Guard Company, Buffalo, N. Y. Application filed September 13, 1907.

This guard for trolley wheels has upwardly converging side portions separated by an intervening uncovered opening, in which the trolley wire may be supported.

901,033. Electric Bell. George L. Patterson, New York, N. Y., assignor to Alice C. Patterson, New York, N. Y. Application filed September 28, 1907.

Details of construction are disclosed.

901,034. Stage Pocket. George L. Patterson, New York, N. Y., assignor to Alice C. Patterson, New York, N. Y. Application filed October 17, 1907.

A floor receptacle has a pair of co-operating lids that are moved by a plate through a set of cranks.

901,078. Method of Treating the Soil. Porfirio Diaz, Hijo, Mexico. Application filed April 15, 1908.

The process consists in placing on the field under treatment conductors having their terminals buried in the ground, and in providing a producer of electric waves of high tension and great frequency, in connection with a parabolic reflector designed to concentrate the waves upon any of the conductors.

901,108. Muffler for Telephone Transmitters. Geo. Kracker, Philadelphia, Pa. Application filed December 28, 1907.

Detachably secured to the transmitter is a sound-deadening casing provided with an auxiliary chamber.

901,117. Wave Motor. John A. McManus, Philadelphia, Pa. Application filed December 28, 1906.

On a central float is a series of pumps connected to piston rods attached to secondary floats. The water pumped passes through a turbine and thus drives an electric generator.

901,122. System of Electrically Controlled Signals for Railways. Jean Paul and Théophile Ducousso, Paris, France. Application filed April 13, 1907.

A transparent casing contains a movable signal controlled by an electromagnet and automatically set by gravity when the magnet is de-energized.

901,127. Apparatus for Telephone Installations. Charles A. Simpson, Chicago, Ill., assignor to the Kellogg Switchboard and Supply Company, Chicago, Ill. Application filed December 15, 1904.

Cross connection between telephone line terminals is arranged for at the arrester springs.

901,171. Electric Burglar Alarm. Simon B. Hess, New York, N. Y. Application filed May 27, 1907.

Associated with an alarm and its switch is a mechanical motor for repeatedly making and breaking the alarm circuit.

901,189. Motor-controlling Apparatus. Michael C. Regan, U. S. Army. Application filed February 4, 1908.

The main controller is electromagnetically controlled from a distant controller.

901,207. Lightning Arrester. Jacob B. Struble, Wilkinsburg, Pa. Application filed December 10, 1906.

Separable arrester elements are arranged in an insulated case, the terminals extending through the walls of the case and adapted to electrically contact with the elements and hold the latter in operative relation with each other.

901,212, 901,213 and 901,214. Telephone Hook Switch. Henry Tideman, Menominee, Mich. Applications filed July 6, 1907.

Adjustments, locking means and operation of the switch group of the hook-switch are disclosed in these three patents.

901,215 and 901,216. Telephone Ringer. Henry Tideman, Menominee, Mich. Applications filed July 6, 1907.

Details of the core and yoke construction of a ringer are covered by these two patents.

901,227. Mold for Casting Rail-bond Terminals. William B. Cleveland, Cleveland, Ohio, assignor to the Electric Railway Improvement Company, Cleveland, Ohio. Application filed July 12, 1907.

The mold has a recess for receiving the end of the bond and a second recess adjacent thereto for forming the bond terminal.

901,243. Automatic Fire-alarm Trip. Frank A. Kehl and Armond F. Wright, Tacoma, Wash. Application filed November 30, 1907.

An electromagnetic stop is arranged to be released by a current impulse.

901,250. Cab-signal System. Daniel J. McCarthy, Wilkinsburg, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Application filed May 19, 1908.

In the cab of a locomotive are two indicators operated by track circuits, one for indicating the condition of an advance track signal, the second indicator for indicating the condition of the track of that block irrespective of the position of the track signals.

901,261. Safety Fuse. Frank D. Reynolds and Joseph Sachs, Hartford, Conn., assignors to the Sachs Company, Hartford, Conn. Application filed April 17, 1906.

An enclosed fuse is provided with a fuse strip having a central rupture portion of circular section, and adjacent portions of flat section.

901,266. Process of Preparing Merchantable Iron from Tin-plate Scrap. Elmer A. Sperry, Brooklyn, N. Y. Application filed March 13, 1908.

The process consists in treating the scrap with a suitable reagent for removing the tin, then treating the resulting black scrap with an electric current in a suitable electrolyte.

901,269. Telephone Ringer. Henry Tideman, Menominee, Mich. Application filed July 6, 1907.

This patent is a modification of Nos. 901,215 and 901,216.

901,280. Electroplating Apparatus. John T. Daniels, Newark, N. J., assignor of one-half to the Hanson & Van Winkle Company, Newark, N. J. Application filed May 11, 1908.

The cathode is surrounded by an inclined permeable rotating container.

901,288. Adjustable Support for Vapor Lamps. Stanwood E. Flichtner, Englewood, N. J., assignor to the Cooper Hewitt Electric Company, New York, N. Y. Original application filed July 28, 1904. Divided and this application filed January 9, 1905.

In combination with an inclined frame and a mercury-vapor lamp supported thereby, is a carriage supporting the frame and means for tilting the frame upon its carriage for starting purposes.

901,294. Apparatus for Electric Lighting. Peter C. Hewitt, New York, N. Y., assignor to the Cooper Hewitt Electric Company. Original application filed April 5, 1900. Divided and this application filed May 3, 1902. Renewed April 15, 1908.

A mercury-vapor lamp in the shape of an arc has an incandescent lamp in series therewith, the latter being located within the arc of the mercury lamp. (See cut.)

901,299. Method of Producing Electric Coils and Conductors Therefor. Isidor Kitsee, Philadelphia, Pa. Original application filed February 11, 1907. Divided and this application filed May 31, 1907.

The method consists in slitting a sheet of conducting material into a number of strips, and applying a web of insulation to one face of the strips to adapt the same as independent windings.

901,306. System of Electric Distribution. Percy H. Thomas, Pittsburg, Pa., assignor to the Cooper Hewitt Electric Company. Application filed January 21, 1903. Renewed February 21, 1907.

A mercury-rectifier system is described.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired October 20, 1908:

461,423. Electric Clock Winder. J. W. DuLaney and C. F. DuLaney, Canton, Ohio.
461,424. Circuit-closer for Clock-winding Mechanism. J. W. DuLaney, Canton, Ohio.
461,437. Thermo-electric Element. C. W. Iden, New York, N. Y.
461,456. Electric Switch. A. Swan, Orange, N. J.
461,464. Non-interfering, Successive-signaling System and Apparatus. F. B. Wood, New York, N. Y.
461,470. Telautograph. E. Gray, Highland Park, Ill.
461,471. Art of Telegraphy. E. Gray, Highland Park, Ill.
461,472. Art of and Apparatus for Telautographic Communication. E. Gray, Highland Park, Ill.
461,473 and 461,474. Telautograph. E. Gray, Highland Park, Ill.
461,493. Electric Elevator. J. E. Byrne, Boston, Mass.
461,548. Contact Plow for Electric Cars. E. M. Bentley, Brooklyn, N. Y.
461,549. Conduit and Conductor for Electric Railways. W. H. Knight, New York, N. Y.
461,552. Field-magnet for Dynamo-electric Machines. F. J. Sprague, New York, N. Y.
461,555. Shunt-magnet for Valve Controllers. J. V. Stout, Easton, Pa.
461,569. Arc-lighting System. R. S. Dobbie, Brooklyn, N. Y.
461,573. Telephone System. C. C. Gould, Buffalo, N. Y.
461,575. Electric Meter. A. B. Herrick, New York, N. Y.
461,631. Insulating Support for Electric Conductors. R. J. Hewett, St. Louis, Mo.
461,650. Electric Arc Lamp. A. Wirsching and R. Schefbauer, New York, N. Y.
461,685. Electric Railway. F. Mansfield, New York, N. Y.
461,690. Electric Railway. S. H. Short, Cleveland, Ohio.
461,748. Annunciator. L. F. Fouts, Trinity Mills, Tex.
461,760. Electric Block-signal System. J. La Burt, New York, N. Y.
461,761. Electric Switch. G. R. Lean, Boston, Mass.
461,795. Armature for Electric Motors or Dynamos. R. Lundell, New York, N. Y.

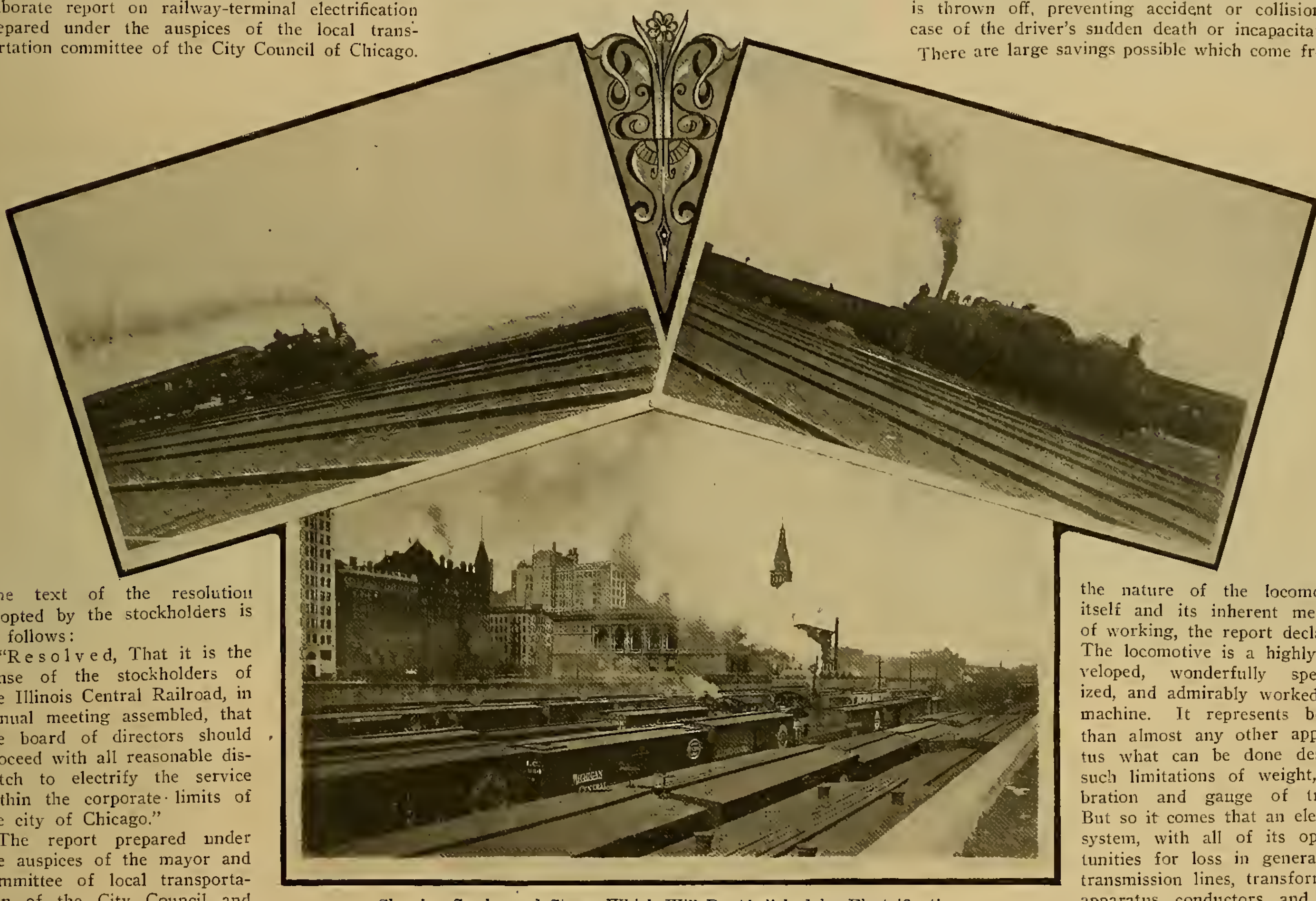
WESTERN ELECTRICIAN

EVERY SATURDAY

Vol. XLIII. CHICAGO, OCTOBER 31, 1908 No. 18

ILLINOIS CENTRAL TERMINAL IN CHICAGO IS TO BE ELECTRIFIED

Surrendering to public sentiment which has been actively aroused against the smoke nuisance from the locomotives on its Lake Front tracks, the Illinois Central Railroad, through its stockholders and directors, has declared for electrification in Chicago. The official action was taken at the annual meeting of the stockholders on October 21st and followed a campaign against the smoke evil led by newspapers and South Side residents, occurring almost simultaneously with the appearance of an elaborate report on railway-terminal electrification prepared under the auspices of the local transportation committee of the City Council of Chicago.



Showing Smoke and Steam Which Will Be Abolished by Electrification
VIEWS ON ILLINOIS CENTRAL RIGHT-OF-WAY IN CHICAGO

The text of the resolution adopted by the stockholders is as follows:

"Resolved, That it is the sense of the stockholders of the Illinois Central Railroad, in annual meeting assembled, that the board of directors should proceed with all reasonable dispatch to electrify the service within the corporate limits of the city of Chicago."

The report prepared under the auspices of the mayor and committee of local transportation of the City Council and given out last week, is entitled in full, "The Electrification of Railway Terminals as a Cure for the Locomotive Smoke Evil in Chicago, with Special Consideration of the Illinois Central Railroad." The material in this book of 353 pages was written or compiled by Milton J. Foreman, chairman of the committee on local transportation, Dr. William A. Evans, commissioner of health, Paul P. Bird and Gilbert E. Ryder of the smoke inspection department, and Herbert H. Evans, mechanical engineer.

The report is divided into general heads covering the smoke evil, while the main portion on electrification considers the general aspects of electrification, systems available, existent installations, the electric handling of freight, the situation in Chicago in general and the Illinois Central's through and suburban passenger and freight service, with the probable cost and results of the electrification of the terminal.

Cleanliness in Chicago is attractive ethically, but vastly more so economically, says the report. Almost every citizen pays toll to the smoke nuisance in increased living expenses in some form or other. Merchants and manufacturers pay it in tangible form. While the railroads consume but 13 per cent. of the coal burned in Chicago, it is generally observed that they contribute most to the public's suffering. This is because locomotive construction and working does not admit of smoke consumption, because the railroad locations in Chicago are such as to distribute the smoke where it is particularly obnoxious, and because the traveling public has to place itself on its journeys directly in the path of trailing smoke.

Comparing the results of terminal operation by steam and by electric traction the report points out that when, instead of burning coal in the locomotive boiler and generating power at the locomotive, the coal is burned under the boilers of a power house, under better conditions and to the more efficient application of motive power, a smaller quantity of coal is consumed per unit of power delivered at the axle under electrical working than under steam traction. For terminal service this is stated to be in about the ratio of one to two. Thus with electric traction only about half the coal, with its smoke-making possibilities, is used, to begin with. Furthermore, one power house supplants the number of locomotives spouting smoke along the entire right-of-way, and it is possible to locate this power house outside of the residence and business districts where persons and materials are subjected to the soot. The power house makes possible more complete combustion with its improved burning devices, and its tall stacks provide better dissemination of whatever smoke is produced.

Ashes from the locomotives are caught up in the strong draft of the exhaust or the rush of the train and scattered in the atmosphere as an irritating dust.

The moist steam in locomotive smoke makes the soot cling tenaciously to any substance it strikes.

The purely rotary motion of the electric motors is expected to eliminate much of the noise due to the reciprocating parts of the steam locomotive.

The authors of the report believe that besides the increased comfort of the public at large and the increased attractiveness to those who use the railroads, the removal of smoke and dirt would work an economy to the community, and have been at pains to compute the saving on merchandise, household effects and laundry and the enhancement of health, property and security from fire.

With electric traction higher speeds might be secured.

Factory switches might be built inside of buildings, economizing space.

Electric operation avoids smoke obscuring signals, approaching trains and track defects, and automatic safety devices are more easily available. Further, the motorman is physically more comfortable than the engineer, and so should be more alert. If the motorman's hand leaves the controller the power is thrown off, preventing accident or collision in case of the driver's sudden death or incapacitation.

There are large savings possible which come from the nature of the locomotive itself and its inherent method of working, the report declares. The locomotive is a highly developed, wonderfully specialized, and admirably worked-out machine. It represents better than almost any other apparatus what can be done despite such limitations of weight, vibration and gauge of track. But so it comes that an electric system, with all of its opportunities for loss in generators, transmission lines, transforming apparatus, conductors, and motors, is able to deliver power at the axle of the tractor at a less cost in operating expenses and in maintenance, because freedom from restrictions enables each link in the chain to be chosen of the highest type of efficiency.

There are at present 26 roads running trains into Chicago terminals. In addition, there are belt, transfer, terminal and industrial lines which have some or all of their trackage within the city. The Chicago terminals are six in number and are grouped around the edge of the business district on two sides of a square. From one to six lines use each terminal. In general, the terminal is owned by one railroad or by a terminal association, and the other roads, under varying agreements, use the terminal trackage to outlying portions of the city, where they enter their own lines.

All freight and passenger trains finish or originate their runs in Chicago—no train passes through the city. At present a large portion of the through freight is brought into Chicago and transferred within the city.

The so-called "Central Station," corner Twelfth Street and Park Row, is owned by the Illinois Central, together with all trackage into it. The station is used by the Illinois Central, the Chicago, Cincinnati and Louisville; Cleveland, Cincinnati, Chicago and St. Louis; Michigan Central, and the Wisconsin Central. There are 100 trains a day, counting freight. In addition, a suburban terminal is maintained by the Illinois Central at the foot of Randolph Street, into which 262 trains per day enter or leave. This is the heaviest suburban service in the city, and as the suburban trackage is a part of the terminal trackage, it is the busiest terminal in the city.

Trackage entering the terminal within the city limits of Chicago amounts to 325 miles for the Illinois Central and to 41.93 miles for the Michigan Central, 7.57 miles of the latter being first and second main track and 34.36 miles yards and sidings. The other roads entering the terminal do not own mileage within the city limits.

"In considering the electrification of the Illinois Central," to quote the commitee's recommendation, "electrification should be carried to the end of the suburban zone—that is, all trackage between South Water Street and Flossmoor (24.92 miles south) should be electrified. The double-track branch from Sixty-seventh Street to South Chicago, and the single-track branch from Blue Island Junction to Blue Island, should be included. The electrification should also be carried out on the Freeport division to Harlem Junction, where the Wisconsin Central trains reach the Illinois Central right-of-way." of the freight yards at the terminal and of the trackage in the vicinity of the Twelfth Street station would be equipped with third rail. Above South Water Street we have assumed that an overhead construction would suffice, generally, of a double-track trolley construction, carried by span wires. The load would be light on these tracks and there would never be occasion for speed."

Reducing its conclusions to figures for initial cost, the commission estimates the price of electrification (without power generation) as less than $4,000,000. The figures submitted are:

Rails, insulators, etc.	$ 580,574
Construction (roadbed)	426,435
Bracket construction	165,336
Span construction	255,360
Overhead work	36,650
Car equipments	450,000
Sub-stations	480,000
Distributing station	120,000
Transmission line	190,203
Thirty-five locomotives at $30,000 each	1,050,000
Change in signals, 30 miles, at $1,000	30,000
Change in station platforms	20,000
Incidentals	2,373
Total	$3,806,931
Credit thirty locomotives available for other parts of line	450,000
Net total cost of electrification	$3,356,931

The daily saving to the company figured under upon a basis of spending perhaps $10,000,000 on the work. The beginning, it is said, will be made next spring, and the passengers of the road can look forward to riding in electric trains by the spring or summer of 1910.

A study of the electrification project of the Illinois Central terminal, undertaken as a graduating thesis assignment, is embodied in a very comprehensive and detailed report made by Mr. Tracy W. Simpson, a senior in the department of electrical engineering of Armour Institute of Technology, to the faculty of that school. This work has been under way for several years. Mr. Simpson has enjoyed the assistance and interested help of a number of prominent engineers and railroad men and has had facilities for obtaining an amount of rather unsual information, for carrying out his investigation. In person he has collected a great amount of operation data of the particular problem and has made a close study of the conditions involved.

As completed his thesis report includes the study, from the viewpoints of first cost and operating cost, reliability and operation, of the following systems of electrification as applied to the Illinois

New York, New Haven & Hartford Passenger Train—Double-Catenary Suspension of 11,000-volt, 25-cycle Power Wire

New York Central Train—600-volt Direct Current from Third Rail

VIEWS SHOWING SMOKELESS ELECTRIC LOCOMOTIVES ON EASTERN RAILROADS

In order to get first-hand information the committee stationed observers at the Thirty-ninth Street station of the Illinois Central, to count the number of trains passing that point during 24 hours, the number and character of cars to each train. From these observations complete diagrams (included in the report) were made showing the tonnage, ton-miles, and expected power load of the electrified system at any time of the day.

The Illinois Central has 3,428 scheduled suburban train-miles daily, 1,315 scheduled suburban train-miles Sunday, 1,054 scheduled daily passenger-train-miles, and 607 scheduled daily freight-train-miles. On the day the observations were taken there was a total operation of 6,435 train-miles, the equivalent of 2,656,435 ton-miles. At 40 watt-hours per ton-mile and 413 tons for the average train this would represent a total of 103,288 kilowatt-hours, or 16.05 kilowatt-hours per train-mile. The maximum kilowatts would be 12,300, and the average kilowatts 4,303.6, and the minimum kilowatts 700, representing a 35 per cent. load factor.

"In computing the probable cost of the electrification of the road," say the investigators, "we have made no provision for the purchase of a power station, since we assume that current can be purchased locally from power-supply companies for seven-eighths cent a kilowatt-hour, or under. If this cannot be done, the railroad could put in a 12,000-kilowatt plant, which would supply current at that figure.

"In the electrification of the road, we have assumed that the power would be purchased and delivered to a distributing station at Twenty-sixth Street, whence it would be carried to sub-stations located at Randolph Street, at Sixty-seventh Street, at Kensington, and at Harvey, and about four miles out on the Freeport division. We have assumed that th entire route-trackage would be equipped with a third-rail system and that the greater part electrification follows:

Locomotive maintenance saved on suburban trains	$ 441
Locomotive maintenance saved on through trains	120
Repairs and renewals, passenger cars	22
Saving on water supply and repairs and renewals of buildings	148
Saving on firemen's labor	150
Saving on coal and ash handling	330
Total a day	$1,212

For the year this saving in the gross would amount to $442,467. From this showing the commission allows these deductions:

Upkeep of line equipment	$ 32,500
Sinking fund on car equipments	27,000
Sinking fund on distributing station	6,000
Sinking fund for locomotives	52,500
Sinking fund for sub-stations	19,200
Sinking fund for transmission line	7,600
Taxes, 1 per cent on $3,356,981	33,570
Total debits	$178,370

From the yearly gross earnings, $442,467, there thus remains a net saving for a year of $264,097.

The preceding estimate of cost was made in accordance with the cheapest satisfactory equipment to be obtained, following an alleged American practice which exercises initial economy, preferring to allow the earnings of the road to take care of future improvements.

"Even if no added traffic come of the electrification," says the report, "this will pay 7.87 per cent. on the investment, or 6.6 per cent. on an investment of $4,000,000 should a better construction be adopted. There will certainly be additional traffic, there will be lessened upkeep of buildings and structures, there will be savings from switching and dead movement, not included in the above, there will be greater mileage capacity, the good will of the public—a number of gains not easily computed."

The cost of electrifying the terminal, the company officials declare, will probably exceed greatly the estimate of $3,500,000 made by the city's engineers. The officials of the road are believed to be figuring Central's Chicago suburban service.

1. A 600-volt, direct-current, third-rail system. All cars motor cars with normal ventilation of motors. Seven sub-stations fed from 20,000-volt distribution line.

2. A 600-volt, direct-current, third-rail systemusing two motors per car, with forced ventilation of motors. Two-thirds of all cars to be motor cars. Distribution as before.

3. A 1,200-volt, direct-current, third-rail system with two 1,200-volt interpole forced-ventilated motors per car. Two-thirds of all cars to be motor cars. Three sub-stations fed from 20,000-volt line.

4. Track and rolling equipment as in No. 3. Current supplied by two direct-current power stations generating at 1,200 volts.

5. Alternating-current overhead trolley, single-phase, 25-cycle, 9,000-volt double-catenary construction supported by steel bridges. All cars motor cars. Normal ventilation of motors. Single power station.

6. Same as No. 5, but with half the number of forced-ventilated motors per car, securing lighter equipment.

The first cost and operating expenses of these six provisional plans are calculated and brought upon a common basis of general expense. As a result the author of the report advises the use of system No. 4, as securing the lowest cost, providing the railroad company is to build its own power house.

The author also points out a requirement apparently overlooked in considering a high-voltage alternating-current trolley construction for the Illinois Central, that by an agreement with the city of Chicago the railroad company cannot erect in the Grant Park district any structure reaching above the retaining wall marking the edge of the lake front park. On account of this stipulation, which will doubtless be rigidly enforced when the new park is completed, catenary construction supported by steel bridges seems out of the question for this most important section of the electrification.

INDUCTION MOTORS IN A PIANO FACTORY

The plant of the Krell Auto Grand Piano Company, Connersville, Ind., is an interesting example of the application of induction motors to woodworking machinery.

Three-phase, 60-cycle, 220-volt current is furnished by the local central-station company. The motors, 20 in number, ranging in sizes from one horsepower to 30 horsepower, inclusive, are of the squirrel-cage type, with the exception of the two elevator motors, which are of the round-rotor type. The entire equipment of motors was furnished by the Triumph Electric Company, Cincinnati, Ohio.

The smaller motors, one horsepower to five horsepower, inclusive, are equipped with special double-throw starting switches, the larger sizes with Triumph air-cooled transformer starters, with the exception of the two elevator motors, which are furnished with Reliance elevator controllers.

In making the installation, the existing conditions had to be taken into consideration, for the factory building had been previously used for the manufacture of furniture, and considerable shafting and some woodworking tools were left in place. It was the desire of the company to begin operations just as quickly as possible, so it was decided to group the new machinery as far as possible with the old. Of course there were some cases where

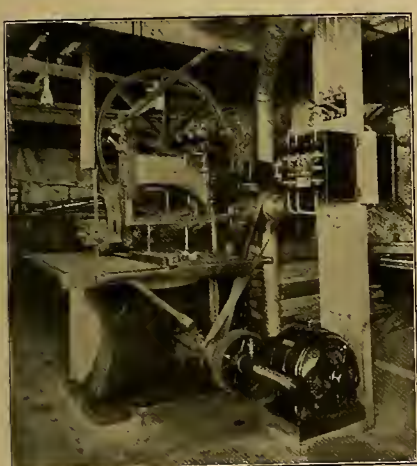


FIG. 1. INDUCTION MOTOR DRIVING BAND SAW IN PIANO FACTORY

it was advisable to move some of the old machines and group them with the new ones which were to be in operation at the same time, and this was done, so that the installation as a whole is above the average motor-driven plant in efficiency.

The heavier machines and those which are used intermittently are driven by individual motors, as are a few of the lighter machines which are so located as to make it impractical to extend a line of shafting to take them in. The general scheme of individual-drive operation is as follows:

Description of machine.	Method of Drive.	Motor Size.	Speed.
Swing saw	Belted	3 H. P.	1,800
42 inch band rip saw	Direct	10 H. P.	1,200
6-foot glue jointer	Coupled	5 H. P.	1,800
30-inch rougbing planer	Belted	12.5 H. P.	1,200
24-inch facer	Belted	3 H. P.	1,800
36-inch sander	Coupled	10 H. P.	1,200
Back-shaping machine	Coupled	15 H. P.	1,200
24-inch planer	Belted	10 H. P.	1,200
Arm-boring machine	Belted	3 H. P.	1,800
Flexible boring machine	Belted	1 H. P.	1,800
Rubbing machine	Belted	1 H. P.	1,800
60-inch veneer knife	Belted	3 H. P.	1,800
Double exhaust fan	Direct	30 H. P.	1,200
Two elevators	Belted	7.5 H. P. each	1,200

There are also five groups of saws and other machines, each group driven by one motor of from three to 25-horsepower capacity.

There is probably no class of machinery in which the power required to drive a given tool varies so much as in woodworking machinery, and this power requirement depends upon the kind of material to be worked. It requires less power to cut thin pine or poplar than heavy elm or oak. It was with a thorough knowledge of the work in hand that the sizes of the various motors for the individual drives were selected, and for the larger group drives it was carefully figured what machines would be in use at the same time so that the motors would operate as nearly as possible at their rated loads and therefore give the highest efficiency and power factor. It might be stated here that in one or two cases the motors installed for the smaller groups are somewhat larger than required for the present connected load; this was done intentionally to provide for the addition of small tools in the future.

It is noteworthy that all of the line-shaft motors and some of the individual-drive motors are inverted and suspended from above and belted either

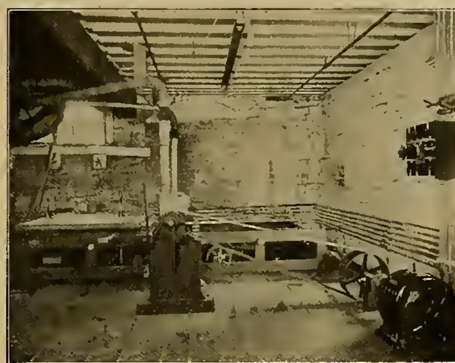


FIG. 2. INDUCTION MOTOR DRIVING BACK-SHAPING MACHINE

across to the line shafts or coupled direct to shafts which are belted through the floor above the tools. In this way floor space and head room are utilized to the best advantage.

Fig. 1 shows an interesting application of a motor to a 42-inch band rip saw. The motor is a 10-horsepower, 1,200-revolution machine fitted with a back-geared bracket on the pulley end. The floor hanger and pulleys have been removed from the saw countershaft. The gearwheel mounted on the countershaft meshes into the rawhide pinion on the motor shaft, and the shaft is carried on the bearing of the motor bracket.

In the roughing mill room a 10-horsepower, 1,200-revolution, back-geared, ceiling-type motor is connected through a flexible coupling to the countershaft of a 36-inch sander. The pulleys on the counter are belted to the machine pulleys on the floor above. It can readily be perceived what an amount of floor space would be required were the motor coupled to the counter on the floor above.

In this room there is an example showing how the counter-shaft of a planer may be done away with entirely. In this case a 12½-horsepower, 1,200-revolution motor with extended shaft on both ends is suspended from above. The extended shaft is carried in ceiling hangers to obtain perfect rigidity and the two pulleys are belted direct to the pulleys of the planer on the next floor which operate at a speed of 3,600 revolutions per minute.

Fig. 2 shows a 15-horsepower, 1,200-revolution

FIG. 3. CEILING MOTORS DRIVING BORING MACHINES

motor connected through a flexible coupling direct to the counter-shaft of a back-shaping machine. The chief virtue of this drive is that one belt is entirely eliminated which would be necessary were the motor belted rather than coupled.

In the mill room a 25-horsepower, 1,200-revolution motor suspended from the ceiling is belted through shafts and counter-shafts to a jointer or woodworker, equalizing saw and other machines. This is one of the cases where the motor would be too small if all of the tools were operated to their capacity at one time. As it is, they are never run in this way, and when a majority of them are in use it is only for a short interval, and the motor is perfectly capable of withstanding a heavy overload for this period.

Fig. 3 is a view of the fitting room and shows a one-horsepower, 1,800-revolution motor suspended from above and belted direct to an arm-boring machine. A three-horsepower ceiling-type motor is also shown belted direct to a flexible boring machine. This picture gives an idea of compact ceiling mounting.

Fig. 4 shows a one-horsepower, 1,800-revolution motor mounted on the floor and belted direct to a rubbing machine. This rubbing machine is one of the great labor savers in a piano factory, doing the work of three men in about one-half the time. Two brushes are fastened on the woven belt, which is operated by a rocker, as illustrated, and a mixture of pumice stone and water is fed from a sprinkler suspended from the ceiling. The piano backs are fed through the machine and thoroughly rubbed down to a fine degree of smoothness preparatory to receiving several coats of varnish. The position of the driven pulley on this machine precludes the mounting of the motor any place except on the floor.

A very important drive in every woodworking establishment, that of the shavings exhaust system, is not illustrated herewith. The motor used is a

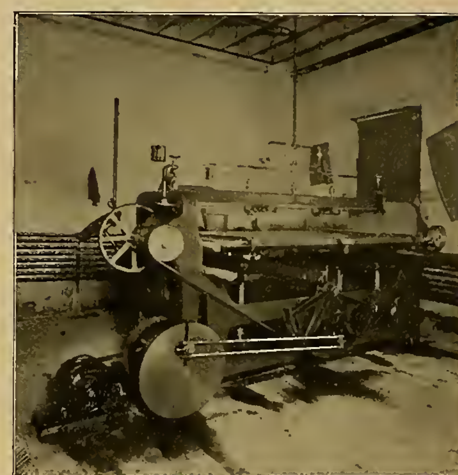


FIG. 4. INDUCTION MOTOR BELTED DIRECT TO RUBBING MACHINE

30-horsepower, 1,200-revolution machine having an extended shaft on both ends with a fanwheel mounted directly on each extension.

It is worth mentioning that there is a 90-horsepower engine lying idle in this plant which was previously used to transmit power through shafting to various woodworking machines, and while there is no actual data at hand from which to make a comparison of the efficiency of the plant now installed with the old engine drive, yet it is known that when the engine was in use, working at its maximum capacity, there was delivered less than one-third the effective horsepower now utilized. Figures taken from similar plants equipped with the motor drive show a gain in efficiency ranging from 30 per cent. to 60 per cent. over the old method.

OPENING FOR ELECTRIC SIGNS IN ENGLAND

A good opportunity exists in the United Kingdom for the introduction of American advertising signs, says United States Consul Albert Halstead of Birmingham, in an official report. The ordinary electric signs are quite common there, but there is a good opening for the introduction of novel signs, such as the intermittent signs, which attract attention by their alternating lighting and extinction, and especially those signs with reflecting letters and light-absorbing backgrounds, and which require little power to make them brilliant.

In many English cities the electric-light supply is under municipal control, and the authorities for the most part are as anxious to increase the use of their current as are private companies. It seems, therefore, that the manager of municipal electric supplies and of specialties furnished by private companies could be interested in the sale of attractive electric signs, and that if an agent who understands British conditions were to be employed, good business might result. It is absolutely useless to attempt to introduce such novelties by correspondence.

PROPOSED STREET-RAILWAY CONSTRUCTION[1]

By C. B. Voynow

In view of the fact that the question of general adoption of T-rail for track construction in city streets is at present agitating many electric-railway managers and engineers, especially with a view of inducing municipalities to permit its use, it is hoped that the proposed construction which is here presented will be considered timely.

In essence the proposed system consists of a track built of a T-rail with a projecting flange above the tread which would guide the car, and a flangeless wheel. The proposed construction is shown in Figs. 1 and 2.

Let us first analyze the doubts and objections that may be raised against this system and which may be enumerated as follows: 1, will the wheels stay

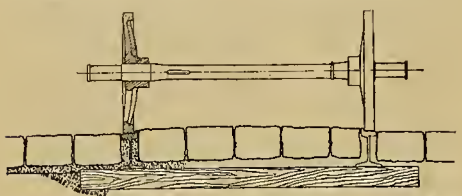


FIG. 1. CROSS-SECTIONAL VIEW OF PROPOSED TRACK AND WHEELS

on the track? 2, dirt on the head of the rail; 3, coning of wheels; 4, why was it not introduced before? 5, difficulty in changing the present system.

The cause of the cars staying on the track may be stated as follows: When the present wheels travel along a railway, the flanges of the wheels striking either gauge line and projecting below the latter, prevent them from running off the rail. Or conversely, the head of the rail projecting into the L-shaped form of wheel tread and flange and striking against the flanges as the latter move along holds the wheels on the rail. In the proposed construction exactly the same principle is involved only with a reversion of terms. Here the entire tread or rim of the wheel performs the functions of the present wheel flanges, and they represent the two movable peripheral projections; while in the new rail the upwardly projecting guards act as the two stationary guides.

In connection with wheels and rails and in so far as their relations affect the present subject, there are four general cases when cars may be derailed: (a) breaking of flanges; (b) mounting of flanges on the vertical side of the rail; (c) obstructions under the flanges of the wheel; (d) obstructions under the tread of the wheel.

A large proportion of the derailments is due to broken flanges, and the expense of maintenance of car wheels is tremendous, on some roads amounting from 20 per cent. to 30 per cent. of the expense of the maintenance of rolling stock. In the proposed system this fundamental weakness does not exist, the design of rail and wheels can be made in accordance with engineering laws as applied to other structures, since the shear caused by the traffic will be borne by the entire width of the wheel tread. Therefore this class of derailments is entirely eliminated.

When the car in its travel swerves from side to side and the flanges press against the gauge side of the rails the friction between the flanges and the rails produces a tendency of the wheels to climb or mount the rail. But as the inclined surfaces of the flanges form a narrower wheel gauge at the lower line than at the tread line, the downward pressure of the weight of the car prevents the wheels from actually mounting the rail. In the new system, as seen in Figs. 2 and 3, while this tendency of mounting and the causes opposing this tendency remain the same, nevertheless it must be considered that this tendency at its maximum condition produces a tremendous shear in flanges, and, in case they have been either previously weakened by wear or originally having had flaws, they give way at this critical moment. This danger is also entirely eliminated by the proposed construction.

In the present construction, and especially in special work, in traveling over narrow-grooved rails or Trilby style rails, or in cases of widening of gauge in tram-rail constructions, should there be an obstruction under the flange, it would cause the wheel to mount, and should the car at that point swerve to the side where the obstruction lies it may cause derailment. Such condition cannot exist in the system proposed.

In case there is an obstruction under the tread of the wheel and the car swings toward the side of the obstruction, a condition would be presented which is identical to both the present and proposed constructions, when the cars may be derailed. Should the car, at the time it strikes such an obstruction, swing toward the opposite side of the obstruction, the present system would have the flange of the opposite wheel pressing against the rail, which would prevent derailment. With the new rail and wheel, should the car swing toward the side of the obstruction the flange of the opposite rail would act in a similar manner as above, so that the condition under which a derailment may occur is practically identical.

After this analysis of the four possible cases of derailment in the present system it will be evident that in the new system, cases "a" and "c" are entirely eliminated, case "b" greatly so, and only "d" retains the same features as at present, and therefore, as a matter of fact, the new track would be comparatively safer than the present one. In case a car does go off the track on account of unavoidable causes it will run on broad-tired wheels instead of the thin flange, which breaks, cuts and destroys everything in its path, so that even in such an emergency it is more economical and safer.

In the proposed construction the tracks will be incomparably less subjected to dirt than at present, for it will be evident that not only will the wagons and cars travel in the same paths, and thus have a double cleaning effect, but from the cross-section of the street it will be seen that a continuous trough between the rails is avoided, the street having the highest level in the middle, with a uniform gradual slope toward the gutters, which will cause the refuse to gradually work to the sides. When snow begins to melt or in case of rainwater in general, the street between the rails would be the driest, for the water having no place to lie will run off crosswise to the gutter instead of running for hundreds of feet along the tracks. And the most remarkable feature is the fact that absolutely no track drains will be required.

As coning soon wears off, the true condition is a reverse coning: the wheels becoming larger in diameter on the back of the tread (what is called false flanges). In electric traction, where good contact between wheel and rail is of great importance, for electrical as well as for tractive reasons (the latter because the wheels have a grinding instead of a rolling action) this cylindrical wheel will be of decided economical advantage.

The most valid objection that may be raised to the proposed system is that, being so radically different from the present method, it would either require the partial suspension of traffic or would represent such formidable difficulties and would involve such an expenditure of money in changing over from the present to the proposed construction that it would practically preclude its adoption. This would be true. With all the advantages the

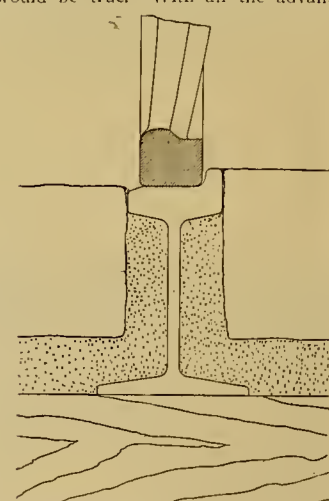


FIG. 2. DETAIL OF SECTION OF PROPOSED WHEEL AND RAIL.

new construction possesses, it could probably never be employed for reconstruction purposes were it not for the change-over method by means of the double-treaded wheels described below, which makes the conversion of present systems to the new as simple as the usual track reconstruction, but with the additional advantage of immediate financial returns in the large curtailment of the maintenance expense in special work and rolling stock.

In reconstruction a division could be selected where the rails are worn out and require rebuilding. This division would be equipped with the crossings of the new construction over the guards of which the present flanged wheels could run. In the meantime a complement of cars equal to the number of cars required by this division would be equipped with the double-treaded wheels (as shown in Fig. 3). This could very easily be done, as there are always a number of cars in the shops. The curved special work of the new construction in this division would be put in during the night preceding the final change. After this the double-treaded wheels may be run on the tracks and the straight tracks may be reconstructed as usual. In some few cases compromise special work may be necessary to use, but this would form a small percentage, and generally this compromise work could be used for other locations of future reconstructions.

In going over the objections I have already mentioned some advantages the new system presents, but the general advantages it represents are as follows:

(*a*) *Ideal Special Work.*—(1) Long life, most of it as permanent as the straight track. (2) No

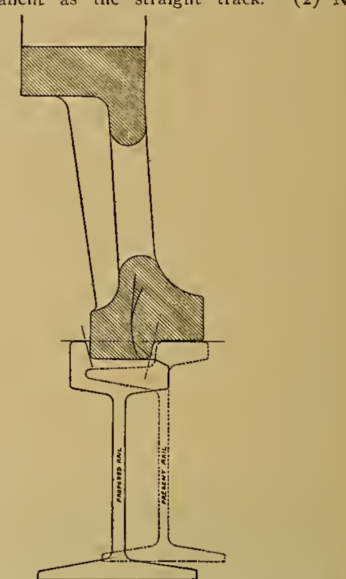


FIG. 3. PROPOSED RAIL AND DOUBLE-TREAD WHEEL, SHOWING RELATIVE POSITION OF PRESENT RAIL

"bumps." The entire system will be "unbroken main line." (3) Extreme simplicity of manufacture. Minute hard steel centers, if any. No casting of intersections together is desired. (4) Most of it built of same rail as straight track. No special rails to carry in stock. (5) Cost at least 25 per cent. less than at present. (6) No possibility of car derailments on account of tongue kicking; no riding on movable tongue.

(*b*) *Ideal Rail Section.*—(1) Easy to roll. (2) Long life of head. (3) Long life of joints, on account of having center bearing for both car and wagon traffic, and therefore the distribution of the stresses at the joints will be central.

(*c*) *Ideal Roadbed.*—(1) Long life, on account of rail advantages cited, and also not having any side strains, the rails will stay permanently spiked to the ties. (2) Permanent paving, for the latter having deep vertical sides to lay against and not having any cross vibrations, it will not heave up or sink, nor does it require any grooves. (3) Less metal exposed through the paving. (4) No track drains, the paving at the center of the street is at the highest level, and the water will drain crosswise to the gutter. (5) No channels in center of street, for water or slush to collect. (6) Easy and thorough sweeping of snow between the rails. (7) Cleaner head, on account of the traffic of cars and wagons (where municipalities so require) being concentrated on the same head, and therefore a saving in motive power. (8) Ease of wagons turning.

(*d*) *Ideal Wheel.*—(1) Long life, the wear can be through the entire chilled surface, and the chill may be made deeper. (2) No breakage. (3) Simple to manufacture, as far as casting is concerned, as well as grinding or finishing. (4) Universality of use, whether city or suburban. In high-speed suburban transit the flanges of the wheels are required to be deeper for safety; this means that the suburban cars cannot enter the city. In the proposed system the rails for high-speed running may be made with higher flanges, which will secure safety, while the cars may enter the heart of the city.

(*e*) *General.*—(1) Avoidance of noise. (2) comfort to passengers.

Each of the above-mentioned advantages will give direct or indirect financial returns. In conclusion, it should be stated that the foregoing describes a system proposed and worked out by Dr. George B. Taylor, assistant engineer of way, Philadelphia Rapid Transit Company, and the author.

1. Abstract of a paper contained in the report of the Committee on Way Matters presented to the American Street and Interurban Railway Engineering Association at Atlantic City, October 14, 1908. The author is assistant engineer of the Philadelphia Rapid Transit Company.

The free evening public schools of Chicago now offer special courses in technical and business training. Among the former are woodworking, pattern-making, forge work, foundry work, machine-shop work, mechanical and freehand drawing, applied mathematics, applied physics, applied chemistry and electricity. These courses are held from 7:30 to 9:30 p. m. five evenings a week at the Lane, Crane and Lake technical high schools.

PROGRESS OF CHICAGO TRACTION REHABILITATION

The great undertaking of rehabilitating the street-car system of Chicago from its late wretched condition to be the model traction system of the country is about half through. This undertaking, which has during the last 18 months cost over $22,500,000, is doubtless the largest electric-traction construction work now going on, so that an account of its progress should be of interest. The Western Electrician has from time to time noted developments in this work, particularly in the issue of November 2, 1907, in which an illustrated article was principally devoted to the three types of track construction being used, the electric welding of the rails and the conduit work for feeder cables.

All the work is being done pursuant to the traction settlement ordinances passed in February, 1907, and approved by popular vote on April 2, 1907. The immediate and complete rehabilitation of the two systems is required within three years after acceptance of their ordinances by the respective companies. This was April 15, 1907, for the Chicago City Railway Company, and January 28, 1908, for the Chicago Railways Company, the latter having been delayed by the reorganization of the former Chicago Union Traction Company into the Chicago Railways Company. The Board of Supervising Engineers was organized in May, 1907, to plan the general features of the work and supervise its construction. The first reconstruction of track work under the supervision of the board was begun on June 17, 1907, on Root Street, between Wallace and State streets, on the South Side, and has been pushed with vigor ever since. On the North and West Sides the work was delayed somewhat by financial tangles that hindered the reorganization of the Union Traction system.

One of the most striking features of the track reconstruction work, aside from its substantial and enduring nature, is the general use of electrical machinery in carrying it out. This has facilitated the work by saving both time and labor and decreasing the cost. Electrical methods have been available to a much greater extent because the work has been almost exclusively on reconstruction of track already electrically equipped with the overhead trolley. Material has been largely hauled to and from the scene of action in electrically equipped work cars, of which each company has quite a number. Electric welding of rails, which has been previously alluded to, has aroused much interest in the city.

Exclusive use of screw spikes has been made in this work for the first time on so large a scale in street-railway work. This spike was designed for use in pine ties in order to obtain a fastening which would permit the removal of rails without disturbing the foundation in which the ties are embedded, and at the same time work the least injury to the tie while being driven in. Holes are first drilled in each tie on each side of the rail by means of an electric drill. The spikes are then screwed in by an electric "screw-driver" and finally given the last set by a hand-operated tool.

ELECTRICALLY DRIVEN CONCRETE-MIXING MACHINE IN USE ON TRACK WORK IN DOWNTOWN STREET, CHICAGO

The three tools are shown in one of the accompanying illustrations. Wood ties have been used almost entirely because it was believed that a sound wood tie, when encased in concrete, was practically indestructible and cheaper than a concrete or steel tie. In order to secure a structurally

ELECTRIC SPIKING MACHINES USED ON TRACK CONSTRUCTION IN CHICAGO

strong wood and to avoid sap wood, yellow-pine ties, 90 per cent. heart, were made standard. These are treated with a preservative to guard against deterioration at the ends or other places that may not be completely covered with concrete.

For mixing the concrete that is so extensively used for the foundation below the ties and around them, motor-driven concrete mixers have been used almost entirely. The accompanying picture shows one in action a few days ago on Dearborn Street in the downtown district. This machine has a bucket into which the crushed stone, sand and cement for a charge are dumped and then charged into the rotating mixing drum by means of a motor-driven hoist.

In the business district the construction authorized by the board is that known as "Type 3," in which a crushed-stone foundation is rolled to a depth of eight inches. On this the ties are placed and surrounded with concrete to a depth sufficient to permit placing the paving blocks. A concrete foundation below the ties was not deemed advisable here, in view of the subway construction contemplated within a few years. A method of carrying this out has been planned by Mr. B. J. Arnold, chairman and chief engineer of the Board of Supervising Engineers, by which the newly relaid tracks may be blocked up under the ties to permit of excavating beneath them without disturbing the continuity of the tracks or the street-car traffic upon them. Thus the crushed-stone foundation now put in would drop out and the track structure would be permitted to rest directly upon the roof of the completed subway.

Special work, such as crossings, curves, crossovers and switches, has been put in generally after the tangents have been entirely completed and in service, so as to permit of its accurate design to the exact conditions prevailing. Great care has been exercised in getting perfect forgings for all this work. On all special work electric welding has not been used, extra heavy bonding being put in to facilitate making future repairs. A difficult piece of special work is shown in one of the pictures given herewith. It is at the junction of Belmont, Lincoln and Ashland avenues on the North Side.

Sub-station development is being provided on a large scale on the South Side to enable the shutting down of the old power houses of the Chicago City Railway Company and the purchase of all its needed power from the Commonwealth Edison Company in accordance with the contract recently executed between these companies, that was noted in last week's issue of the Western Electrician. There are now in operation three sub-stations exclusively for railway service on the South Side, receiving 25-cycle, three-phase current at 9,000 volts from the Fisk Street station of the Edison company and converting this to 600-volt direct current for the trolley service. There is also a 1,200-kilowatt rotary converter at the Plymouth Court sub-station of the Commonwealth Edison Company near Van Buren Street that supplies exclusively the current for the downtown Clark Street, State Street and Wabash Avenue lines.

The sub-station at Twentieth and Dearborn streets will be enlarged to contain ultimately three 1,000-kilowatt and four 2,000-kilowatt rotary converters. The sub-station on Wentworth Avenue, near Sixty-

[*Continued on page 330.*]

A DIFFICULT PIECE OF SPECIAL TRACK WORK IN CHICAGO

WESTERN ELECTRICIAN

EVERY SATURDAY

PUBLICATION OFFICES:

507 Marquette Building - - - CHICAGO

TELEPHONE, MAIN 1746

Eastern Office, 150 Nassau Street, New York

Telephone, 5220 Beekman

Trade Supplied by Western News Co.

SUBSCRIPTION, in advance, postage prepaid, $3.00 for a full year of 52 numbers in the United States, Alaska, Porto Rico, Cuba, Mexico, Hawaii and the Philippines; in clubs of four or more, $2.50, with free extra copy for eight subscriptions; Canada, $4.00 a year; other foreign countries in the Postal Union, $5.00 a year; single copies, 10 cents. When change of address is requested, the *old* address as well as the new should be given.

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 photographs or drawings, communications, views, news items, local newspaper clippings, or any information likely to interest electrical men, will be thankfully received.

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 UNEQUALED VALUE of this journal as an advertising medium in its special field. Advertising rates are moderate, and will be furnished on application.

REMITTANCES.—All checks, drafts and other remittances should be made payable to the order of the publishers, the *Electrician Publishing Company*, and addressed to the offices of publication, Suite 507, Marquette Building (204 Dearborn Street), Chicago, Illinois, U. S. A.

CONTENTS OF THIS NUMBER

DEPARTMENTS

PUBLISHER'S ANNOUNCEMENT

With this number the Western Electrician will be discontinued in its present form, and, beginning with the issue of November 7th next, will be published jointly with the Electrical Review of New York as the "ELECTRICAL REVIEW AND WESTERN ELECTRICIAN."

The Western Electrician was founded by W. A. Kreidler in 1887, and has been continuously successful, gathering to its support the entire western electrical fraternity. Its purchase by the Electrical Review and the continuance of the publication office in Chicago are in line with the progressive spirit of American enterprise and assure the preservation of those characteristics which have won for it the support it has received.

The enterprising methods and high character of the editors and publishers of the Electrical Review are well known to a large number of the readers of this journal, and we bespeak for them the same cordial endorsement that has been extended to us.

CHICAGO is the scene of what is undoubtedly the largest and most important job of electric-railway construction now under way in this country. This is the rehabilitation of the surface street railways of Chicago by the local companies under the direction of the Board of Supervising Engineers, Chicago Traction. Under the admirable traction ordinances adopted by the voters in April, 1907, in settlement of the vexatious street-railway embroglio that had been a nightmare for a decade, the Board of Supervising Engineers has express control of the reconstruction of the street-railway properties of Chicago and their maintenance. This is a great work. Some account of the progress so far made in carrying it out is given in an illustrated article in this issue. It will be seen that not only is the work extensive but that it is of a very high order of excellence.

A few weeks ago the economy and quality of the work done by the Board of Supervising Engineers was questioned by a member of the Chicago City Council. This alderman was evidently not acquainted with the terms of the traction ordinances when he attacked the authority of the board thereby constituted and sought to have it abolished as a useless and wasteful luxury. To the observant citizen of Chicago these accusations were known to be manifestly without foundation, but in a dignified letter sent by the board to the city controller with its last monthly report the charge of extravagance is shown to be entirely baseless.

It was shown that the sum of $18,198,484 has been expended by the railway companies on the rehabilitation of their roadways and equipment since the new ordinances went into effect. The expenses of the board in designing and supervising this great work have amounted to $283,099, which is but 1.38 per cent. of the cost of the work done since the board took charge of it for the city. In the letter referred to the board says: "The customary fees for work of this character intrusted to the board (but not including various administrative and auditing duties which are imposed upon the board by the ordinances) are from three to five per cent., depending generally upon the magnitude of the undertaking." Thus, instead of criticism the board deserves praise for its economy, just as it has won the admiration of the city for the enduring nature of its work.

Perhaps the subject should not be dismissed without a reference to the recent attack on Mr. Bion J. Arnold, chairman and chief engineer of the Board of Supervising Engineers, accused of activity in partisan politics by one alderman in the City Council. Everyone who knows Mr. Arnold knows that he is an engineer and not a politician and that he has been scrupulous to the last degree in administering the affairs of the Board in a purely non-partisan manner. No importance is to be attached to these attacks, which must be expected, perhaps, by every man doing public work. An honest, high-minded professional man like Mr. Arnold can afford to ignore them, but his friends will be disposed not to let them go by without a word of protest.

GOETHE, DYING, according to the legend, cried for "More light, more light!" But his fellow-countrymen of these latter days appear to have disregarded the spirit of his appeal—an appeal which has both a physical and an intellectual significance. The government proposes, it seems, to put a tax on electricity, whether used for light or power, and also on gas lighting. In casting about for more revenue, which appears to be badly needed, this unique method of taxation seems to have occurred to the authorities. The plan has not been disclosed officially as yet, but according to one account the bill taxes consumers five per cent. on their payments to the electric and gas companies. It also taxes every electric and gas burner sold an amount varying from 2 to 12 cents. The proposed manner of taxing current used for other purposes than lighting has not been mentioned in the reports that have reached this country.

Naturally, there has been a great outcry from commercial and manufacturing circles, for a more reactionary plan it would be difficult to conceive. Opinions are practically unanimous that the measure is a blow to industrial prosperity and calculated to arrest the rapid progress due to electrical advancement. In Bavaria, in particular, there will surely be bitter resistance to this plan from Berlin. There is an opportunity to use the power of Bavarian waterfalls for electric-railway operation and other purposes. Not only so, but Bavaria desires to attract manufacturing industries which would be supplied with electricity furnished by the state, and more than one important firm has been prevented from acquiring possession of waterpowers for the establishment of factories by the resolve of the Bavarian government to be the first in the field. It is obvious that an imperial tax on electricity would seriously interfere with these cherished plans.

A fight on the measure in the Reichstag at Berlin appears to be inevitable. We hope that the advocates of light and power, of enlightenment and progress, will triumph over the proponents of the measure, which is an anachronism in the twentieth century. Perhaps, indeed, the storm of disapproval with which the project has been received will induce the government to withhold the proposed bill altogether.

IT IS A PECULIAR pleasure to chronicle in this last issue of the Western Electrician as a separate journal the official announcement that the management of the Illinois Central Railroad has decided at last to electrify its Chicago terminal. For several years the Western Electrician has labored diligently to the end that this most desirable result be brought to pass. Of late the powerful agencies of united public sentiment on the South Side of Chicago and the daily press, with the friendly co-operation of the city administration, have come into play, and the result is the stockholders' direction to the directors to go ahead with the work.

This decision is gratifying in every aspect. Electrically operated Illinois Central trains in Chicago will result in the abolition of the smoke and cinder nuisance and a great diminution of the noise of operation, and so will bring about the relief greatly desired by the public. The company will reap the great advantage of improved, modernized and more popular service. Probably, also, the electric system will be found more economical in operation. And lastly the electrical industry will not only profit by the business brought to it by this particular undertaking, but it is likely that the Illinois Central will prove merely the forerunner of all the other railroads entering Chicago in terminal electrification.

The achievement seems to be one where mutual congratulations are in order, and the Western Electrician is proud of the part it has taken in advocating this great improvement.

INTERNATIONAL CONFERENCE ON ELECTRICAL UNITS AND STANDARDS IN LONDON

[From the London correspondent of Western Electrician.]

London, October 16.—By the invitation of the British government an international conference on electrical units and standards is now in progress in London and will continue its sittings into the middle of next week. The object of the conference is to obtain international agreement on the three electrical units, the ohm, the ampere and the volt, so that the realization of these units may be as nearly as possible identical throughout the civilized world. The list of delegates is as follows:

United States, Dr. Henry S. Carhart, Dr. S. W. Stratton, Dr. E. B. Rosa; Belgium, Mr. Gerard, Mr. Clément; Denmark and Sweden, Prof. S. A. Arrhenius; Ecuador, Mr. Don Celso Nevares; France, Mr. Lippman; Germany, Dr. Warburg, Dr. Jaeger, Dr. Lindeck; Great Britain, Right Hon. Lord Rayleigh, Prof. J. J. Thomson, Sir John Gavey, C. B., Dr. R. T. Glazebrook, Major W. A. J. O'Meara, C. M. G., Mr. A. P. Trotter; Guatemala, Dr. Francisco de Arce; Italy, Prof. Antonio Roiti; Japan, Mr. Osuke Asano, Mr. Shigeru Kondo; Mexico, Mr. Alfonso Castello, Mr. Jose Maria Perez; Netherlands, Dr. H. Haga; Paraguay, Mr. Maximo Croskey; Spain, Mr. Jose Maria Madariaga; Switzerland, Dr. F. Weber, Dr. Pierre Chappius, Dr. J. Laudry; Australia, Mr. Cecil Darley, Prof. Threlfall; Canada, Mr. Osmond Higman; Crown Colonies, Major P. Cardew; India, Mr. M. G. Simpson.

As pointed out by the president of the Board of Trade, Mr. Winston Churchill, M. P., who officially opened the conference, 15 years has passed since the last international congress, at which definite resolutions were passed as to electric units, and the resolutions at Chicago in 1893, based as they were upon the conclusions reached at Edinburgh in the previous year, have formed the starting point of legislation in various countries. The present conference owes its inception to the resolution agreed to by the delegates to the St. Louis congress four years ago. The procedure now being pursued is based upon that adopted at the Berlin conference on wireless telegraphy, a set of rules having been drawn up and agreed upon beforehand by the delegates. As these rules laid it down that the presidency of the conference should rest with the country of its origin, Lord Rayleigh was unanimously elected to this post. The work of the conference consists of approving general principles, while the detailed work is under consideration by a technical committee comprised of 24 members who report to the conference.

The first matter to be considered was a resolution to the following effect, which was moved by Mr. A. P. Trotter, electrical adviser to the Board of Trade, and one of the British delegates:

"The conference agrees that, as heretofore, the magnitudes of the fundamental electric units shall be determined on the electromagnetic system of measurement with reference to the centimeter as the unit of length, the gramme as the unit of mass, and the second as the unit of time.

"These fundamental units are (1) the ohm, the unit of electric resistance, which has the value of 1,000,000,000 in terms of the centimeter, and second, (2), the ampere, the unit of electric current, which has the value of one-tenth (0.1) in terms of the centimeter, gramme and second; (3) the volt, the unit of electromotive force, which has the value of 100,000,000 in terms of the centimeter, gramme and second."

This was seconded by Dr. S. W. Stratton (United States) and carried unanimously.

A resolution was then proposed by Professor Warburg (Germany) "That the international ohm shall be defined as the resistance of a specified column of mercury," and this was declared to be carried unanimously.

Professor Warburg (Germany) then proposed the following resolution:

"The international ohm is the resistance offered to an unvarying electric current by a column of mercury at the temperature of melting ice, 14.4521 grammes in mass, of a constant cross-sectional area, and of a length of 106.300 centimeters. To determine the resistance of a column of mercury in terms of the international ohm, the procedure to be followed shall be that set out in Specification A attached to these resolutions."

The specification referred to lays it down that the column of mercury shall be of circular section, or nearly so, and shall be contained in a tube of suitable glass which has been carefully annealed. It also specifies the maximum variation in the area of cross-section, the determination of the weight of mercury, the manner of making the electrical measurements, etc.

The most important speech upon this resolution was made by Dr. E. B. Rosa (United States) as follows:

"I would like to raise the question as to whether it would not be better to specify the length of the column as one meter, and to give the weight accordingly, so that the resistance shall be one ohm. It would be about 12.7898 grammes instead of 14.4521 as the exact equivalent. The reason for that is that the designation now in use, which is now proposed, has two odd figures, and if the specification for the ohm is ever changed, as it certainly is likely to be, as we come more nearly to the absolute value of the ohm, it would be necessary to change both figures. It would be necessary to use, for example, instead of 106.300, something different and also to change the weight, and every time that is changed, if it were changed, it would be necessary to change two figures, and both would always be odd. If, however, we specified the length as one meter exactly, that would never be changed; only the weight would be changed, and only one odd figure would have to be remembered. We would go back to the Siemens unit as to length and specify the weight of the mercury instead of the cross-section.

"I think there is no doubt that if Siemens had expressed the weight of the mercury, if he had said that his resistance unit was one meter long and such and such a weight, then when the change was made to the present value, instead of lengthening the column they would have reduced the weight, and the length would have been kept constant, one meter. At Chicago, instead of lengthening it by three millimeters they would have slightly reduced the weight again, and the length would still have been one meter.

"It may be said that this is a change which it is undesirable to make; but 106.300 has only been in existence, so far as the definition is concerned, about 15 years, and that certainly is a very short period compared with the future. It was only the last Congress that fixed that figure, and therefore one cannot say there is any very venerable tradition connected with that particular member; one meter certainly has a distinct advantage in being not only an even round number, but a number that would never be changed so long as the mercury unit were used, and it would only be necessary at any time that it was proposed, slightly to alter the weight, making it in the last place or possibly in the last two places, very slightly different.

"I do not know that the conference will be ready to vote upon this, or even to consider it at the present time, but I would like to ask, if there is any opposition to it, as I presume there will be, that it may be referred to the technical committee to report to this body at a later date."

After some discussion, in which it was clear that Great Britain and Germany opposed the change suggested, Dr. Rosa's proposition that his suggestion should go before the technical committee was seconded by Dr. Arrhenius (Denmark and Sweden) and carried by 16 votes to five, two countries, one of which was Japan, remaining neutral.

When the question was considered in detail by the technical committee, Dr. Rosa's proposition was rejected by a substantial majority.

At the meeting of the conference on Wednesday, October 14th, the following resolution was passed, after some discussion:

"The ampere is the second primary unit."

The conference was still sitting when these notes were written. G.

SALT RIVER PROJECT

The Salt River reclamation and power-development project in Arizona (see Western Electrician of August 15, 1908) is now 72.5 per cent. completed. The lowest point of the Roosevelt Dam has reached an elevation of 47 feet and the highest point an elevation of 78 feet. The masonry work was at the close of September 40 per cent. completed. The cement mill ran for 25 days, giving an output of 12,200 barrels of clinker and the supply of cement necessary for construction purposes. Good progress was made in setting poles and stringing wire for the transmission line. Concrete work and excavation on the Grand Canal were continued throughout the month. Water was delivered under the canal system without interruption.

ONTARIO TRANSMISSION LINE FROM NIAGARA FALLS

The contract has at last been signed between the Ontario Hydro-Electric Power Commission and the F. H. McGuigan Construction Company, Toronto, which provides for the construction of a network of transmission lines for the purpose of distributing electric power from the commission's plant at Niagara Falls to various cities, towns and villages in the province of Ontario. The contract price is $1,270,000 for some 290 miles of line, and is said to be the largest contract of its kind ever awarded.

Toronto, Guelph, Hespeler, Waterloo, Berlin, Woodstock, Galt, London, Ingersoll, St. Mary's, St. Thomas, New Hamburg, West Toronto, Weston, East Toronto, Norwich, Walkerville and Windsor are the places to be supplied with power, and each one is now arranging for the purchase or construction of a distributing plant, for the commission agrees only to deliver the power to the municipal authorities and will not distribute it.

St. Thomas will be the terminal of the transmission lines, but the government is considering the construction of another 300 miles of line which will take in a number of other places, and F. H. McGuigan has offered to construct this additional stretch of line at the same rate per mile.

Three cables, each suspended from a separate insulator, will form a single circuit, and these circuits will be suspended on some 3,200 towers. These towers will be 550 feet apart, except where the conditions are such that a shorter distance is necessary. The estimates call for approximately a million pounds of aluminum wire, the total mileage of cable being 1,149, not counting the ground lines or those for lightning protection. Twelve transformer houses will be required. The standard two-circuit tower will be 44½ feet high over all and 16 feet square at the base. Each tower will have four legs, each of which will be anchored in seven feet of concrete. The lines will be built to stand a voltage of 110,000. The towers will cost $621,000 and a double telephone line will be strung on them in addition to the power wires. The Ontario Iron and Steel Company, Welland, and the Canadian Bridge Company, Walkerville, Ont., will make the towers, while the wire will be made at Shawinigan Falls by the Northern Aluminum Company of America.

INSPECTION IN TOLEDO

The first annual report of the Toledo (Ohio) Municipal Inspection Department has just been issued. The electrical ordinance requires all electricians installing wiring for electric light, heat and power to register with the inspector, and, if deemed necessary, to submit to an examination. Through the enforcement of this section 156 certificates of registration were issued and 46 applications for permission to register were refused. Three hundred and fifty copies of the National Electrical Code were distributed.

The average number of defects found on each new installation during the first inspection have been reduced from six to three, and the number of visits necessary to bring the work up to standard has been reduced from five or six to two. The department is a little short-handed, and additional inspectors will probably be provided, although the collection of inspection fees has been slow. Interest in the National Electrical Code has been stimulated among the local wiremen, with the result that clubs have been organized among them for the purpose of discussing the details of good construction work. Many old and defective equipments have ben overhauled through the efforts of the department, and in some instances the owners of these equipments requested the inspection, showing a disposition on the part of business interests to eliminate unnecessary fire hazard. The department inspects the portable equipments of traveling theatrical companies, and moving-picture machines have been enclosed in standard booths. The department is planning to require additional safeguards in wiring installations during the coming year.

HOW TO SECURE A PATENT IN THE UNITED STATES

By H. G. Ward

The American law provides that "any person who has invented or discovered any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country before his invention or discovery thereof, and not in public use or sale for more than two years prior to his application, unless same is proved to have been abandoned, may upon payment of the fees required by law, and other due proceedings had, obtain a patent therefor." All patents are issued in the name of the United States of America, under the seal of the Patent Office, and are signed by the secretary of the interior and countersigned by the commissioner of patents. They are recorded, together with the specifications, in the Patent Office, in books kept for that purpose.

Fees and charges in taking out a patent are as follows: On filing each original application for a patent, $15; on issuing each original patent, $20; in design cases, for three years and six months, $10; for seven years, $15; for 14 years, $30; on filing each caveat, $10; on every application for the reissue of a patent, $30; on filing each declaimer, $10; on the granting of every extension of a patent, $50; on an appeal for the first time from the primary examiner to the examiners-in-chief, $10; on every appeal from the examiners-in-chief to the commissioner, $20. Copies of drawings usually cost $5 a sheet.

Thus the bare cost of obtaining a patent is $35 for the government fee and $5 for a drawing, but in cases of a complicated nature the total cost of the patent will be more. However, the government fees are the same in all cases. It should be borne in mind that the rules of practice of the Patent Office advise that the assistance of competent counsel will, in most cases, be of advantage to an applicant for a patent.

Application papers comprise the petition, specification, oath, together with drawing, which must be filed in the Patent Office together with the first government fee of $15. As soon as the application is filed the applicant is protected against the grant, without his knowledge, of a patent of the same thing to another person. The petition, oath and specification must be written in the English language. From the viewpoint of the Patent Office it is desirable that all parts of the complete application be deposited in the office at the same time, and that all papers in the application be attached together.

Applicants for patents should not forget that the actual value of a patent is measured by the character of its claims. On this point a well-known patent attorney says: "While formerly the impression prevailed to a great extent that the essential thing to insure protection was a patent of some kind, the manufacturing public has been educated to understand that the vital and all-important part of the invention is its claims. If the claims are narrow and restricted, the patent is comparatively worthless; on the other hand, if the invention is well covered by broad and comprehensive claims, it will be found that the patent is readily endorsed by manufacturers."

Before any inventor can receive a patent for his invention he must make application therefor, in writing, to the Commissioner of Patents, and must file in the Patent Office a written description of the same, and the manner and process of making, constructing and using it, in such full, clear, concise and exact terms as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct and use the same. In the case of a machine, the inventor must explain the principle thereof, and the best mode in which he has contemplated applying the principle, so as to distinguish it from other inventions. The inventor must particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery. The specification and claim must be signed by the inventor and attested by two witnesses.

Inventors will do well to remember that a well-prepared specification and well-accentuated drawings will greatly expedite the allowance of an application by the Patent Office, as the examiner is thus relieved of annoyance and unnecessary work in the examination of the case. A case which is poorly and incorrectly prepared entails upon the examiner much study and extra labor in determining just what the applicant is seeking to claim. Loosely drawn specifications and inferior drawings naturally have a tendency to prejudice the examiner in his action.

An inventor has the right to call his invention what he pleases, provided he does not assume an already existing and popular name, to the prejudice of those who have preoccupied the name.

As a general rule, a single patent cannot embrace two devices which are wholly independent of each other, or embody distinct improvements upon unconnected machines. But where two or more devices relate to one subject or are connected in nature and operation, the courts have held that they may be secured by a single patent.

A patentee cannot claim in a patent the same thing claimed by him in a prior patent, nor cover what he omitted to claim in a prior patent in which the invention was described, unless he reserved the right to claim it in a separate patent, and seasonably applied therefor.

An inventor who makes any new invention and desires further time to mature the same may, upon the payment of the government fee of $10 and $5 for a drawing, file in the Patent Office a caveat setting forth the design thereof, and of its distinguishing characteristics, and praying protection of his right until he shall have matured his invention. The caveat will be filed in the confidential archives of the Patent Office and preserved in secrecy. It will be operative for the term of one year from date of filing. If application is made within the year by any other person for a patent with which such caveat would in any manner interfere, the commissioner of patents will deposit the description, specification and drawings of such application in like manner in the secret archives, and give notice thereof to the person by whom the caveat was filed. If such person desires to avail himself of his caveat, he must file his description, specifications and drawings within three months from the time of notification. A caveat answers a double purpose, first, to give notice of the inventor's claim, and, second, to prevent a patent from issuing to another for the same thing.

Patentees and their assigns and legal representatives, and all persons making or vending any patented article for or under them, must give sufficient notice to the public that the same is patented, by fixing thereon the word "patented," together with the day and year the patent was granted. When this cannot be done, owing to the character of the article, it will be sufficient to affix a label to the packages containing the articles a like notice. Severe penalties are provided for falsely marking or labeling articles as "patented."

A joint patent may be granted for a joint invention. When an invention is the result of the combined mental operation of two persons acting together, as neither can claim to be the sole inventor, the invention is joint, and they are jointly entitled to a patent on the article.

The duration of a patent is 17 years.

It is quite impossible to state with any degree of certainty the time required to secure the allowance of a patent. As all the various divisions of the Patent Office are considerably in arrears in their work, it takes from two to four months to procure a patent. Of course, when there are interferences or other obstacles to overcome the time required to do this is still longer.

Every patent or any interest therein is assignable in law. There are three classes of persons in whom the patentee can vest an interest of some kind in the patent. The first is the assignee, who may have had transferred to him in writing the whole interest of the original patent or an undivided part of such whole interest in every portion of the United States. The next is the grantee, to whom is transferred the exclusive right under the patent to make and use, and to grant to others to make and use, the thing patented within and throughout some specified part of the United States. The third class embraces the licensee, to whom may be transferred a less or different interest than either the interest in the whole patent, or an undivided part of such whole interest, or an exclusive sectional interest.

In conclusion attention is invited to a decision rendered in 1892 by Mr. Justice Brown in the Supreme Court of the United States, in which the following statement appears: "The specification and claims of a patent, particularly if the invention be at all complicated, constitute one of the most difficult legal instruments to draw with accuracy, and in view of the fact that valuable inventions are often placed in the hands of inexperienced persons, to prepare such specifications and claims, it is no matter of surprise that the latter fail to describe with requisite certainty the exact invention of the patentee, and err either in claiming that which the patentee had not in fact invented, or omitting some element which was a valuable or essential part of the actual invention."

ELECTRICAL INSPECTORS' CONVENTION

The fourth annual meeting of the Western Association of Electrical Inspectors in Chicago last week was a successful and helpful meeting. More than fifty members were in attendance upon the daily meetings and the underwriters' demonstration of electrical tests.

At the opening session of Tuesday morning, October 20th, as noted in the Western Electrician of last week, the address of President E. R. Townsend was followed by a number of official and committee reports.

On Wednesday morning Charles Nutter, electrical engineer of the Atchison, Topeka and Santa Fe railroad, delivered an address on the subject of "Grain Elevator Wiring." He called attention to the special conditions to be met in the dust-laden atmosphere encountered in this class of buildings, and advised the use of vapor-tight globes on electric lamps and wiring construction in iron conduit throughout.

William H. Blood, insurance expert for the National Electric Light Association, followed with the topic, "Electrical Inspection from the Viewpoint of the Central Station," in which he urged closer co-operation between the inspectors and the central-station companies. The report of the committee on grounding conductors for safety was then read by Frank R. Daniel, chairman, Indianapolis, Ind.

By a rearrangement of the program the convention business planned for Thursday morning was transacted the preceding afternoon. The report of the committee on public safety was presented by W. J. Canada, chairman, Denver, Colo., and F. H. Moore of Indianapolis, chairman of the committee on architects' specifications, followed with his report. William S. Boyd of Chicago then gave the report of the committee on laws and ordinances.

The officers for the ensuing year elected at this meeting were: President, George D. Bayle of Chicago; vice-presidents, Frank R. Daniel of Indianapolis, Ind., and Fred E. Hough of Duluth, Minn.; secretary-treasurer, William S. Boyd of Chicago (re-elected).

On Thursday morning the members of the association met at the Underwriters' Laboratories, 382 East Ohio Street, and listened to an address by William H. Merrill, manager, on "The Underwriters' Laboratories and Its Work." His talk was followed by an interesting series of tests of electrical apparatus and fittings carried to destruction. This feature proved especially instructive since the inspector has little opportunity to witness failures of installations and apparatus of the character he inspects, and as a result of the tests shown the useful quality of the code regulations was impressed upon the inspectors.

Among the entertainment features enjoyed by the members of the association was a dinner to the inspectors at the Hotel Bismarck, tendered by the Contractors' Association of Chicago, and an inspection trip on board the Sanitary Ditstrict's yacht, Robert R., down the Drainage Canal, to the Lockport generating plant.

In reply to the report circulated in the newspapers of the country that the Patent Office collection of 157,000 models was to be destroyed, given away or sold, Commissioner Edward B. Moore has denied that there has been any intention to destroy these models of patents which were accumulated by the government up to 1880, when mechanical drawings were substituted for models in the filing of claims by inventors.

ALTERNATING CURRENTS AND THEIR APPLICATIONS

By Edson R. Wolcott

CHAPTER I.—GENERAL PRINCIPLES

Part V.

Transformers (*Continued*)

Losses in Transformer

The losses that occur are those in the conducting primary and secondary coils, the magnetic losses of the iron core and the losses due to currents that are induced in the iron core, which are known as eddy currents.

Copper Losses

The losses in the coils are those that occur in any conductor carrying a current, being proportional to the square of the current flowing, thus:

$$\text{Losses in primary coils} = I_p^2 R_p$$

where I_p is the effective value of the current flowing in the primary and R_p the resistance of the primary; also the

$$\text{Losses in secondary coils} = I_s^2 R_s$$

where I_s is the current in the secondary, the resistance of which is R_s.

The current flowing in the secondary of a transformer in case its efficiency was 100 per cent. would be the inverse ratio of the number of turns in the two coils. For example, in the transformer illustrated in Fig. 12 (page 313), with 10 amperes in primary there would be five amperes in secondary. But since there is some loss in transforming the current the actual value that would be found in the secondary would be obtained by taking 97 per cent. of the energy delivered to the primary and dividing it by the electromotive force of the secondary, thus:

$$\text{Energy delivered to primary} = E_p I_p$$

where E_p is the potential drop across the primary and I_p the current flowing therein.

$$\text{Current in secondary} = \frac{97}{100} \frac{E_p I_p}{E_s}$$

where E_s is the potential drop across the secondary terminals or in the case of the transformer of Fig. 12 twice that of the primary.

Hysteresis

The magnetic losses of the transformer are due to the fact that a changing magnetic field heats the iron, and some energy is therefore lost. This heating of the iron resembles the heat generated in friction of moving parts; in fact, it is a sort of magnetic friction. These losses of course are greater the greater the frequency of the alternating current, and are usually called hysteresis losses.

Eddy Currents

There is another loss in the iron core of the transformer, and this is due to the fact that the alternating current of the primary induces currents in the iron core itself as well as in the secondary windings; in fact, currents would be induced in any conductor that lay within the changing magnetic field. The magnetic lines of force are always at right angles to the current, and vice versa. Since in the transformer the lines of force encircle the iron ring, the currents induced by them would be little circular ones surrounding them, just as the circular magnetic lines for force surround the linear conductor carrying a current.

By using a laminated instead of a solid iron core, as shown in Fig. 13, the path of the eddy

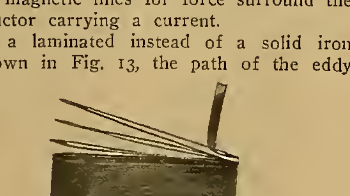


FIG. 13. FIELD COIL

currents is interrupted to a considerable extent; the losses are proportionately diminished, while the magnetic flux is not materially affected.

Impedance

Opposition to the Flow of an Alternating Current

When a direct-current generator is connected to the primary of a transformer a current will be induced in the secondary only at the instant of closing or opening of the switch or when the current is varying. The value of the current in the primary is expressed in the ordinary way:

$$I = \frac{E}{R},$$

where I is the number of amperes flowing, E the potential difference across the terminals of the primary, and R the resistance of the primary coil When an alternating current of the same effective value is applied to the terminals of the primary a much weaker current is observed. The inductive action of the fluctuating current produces an increased opposition to the flow of the current, so that it cannot be expressed by the same equation, and a new one must be substituted, as, for instance, the following:

$$I = \frac{E}{Z},$$

where E is the effective value of the electromotive force, having the same value as E in the first expression, I is the effective value of the current and Z the total opposition to the alternating current, which is called the impedance. It contains the resistance R as one factor, and the problem now is to analyze it and find what the other factors are and how they are related to the ordinary ohmic resistance R.

Inductance

It has been found by experiment that the inductive action of any coil of wire depends on the size and shape of the coil, the number of turns of wire and their distance apart, whether the coil is filled with iron and, if so, its magnetic strength, as well as the value and frequency of the alternating current flowing through it. It will be noticed that all except the last two items are properties of the coil. It is therefore convenient to give their combined effect a name. It is, in fact, called the inductance, and is represented by the letter L.

Permeability

To repeat: The inductance of any coil is a constant depending on the size, shape, number of turns of wire, their distance apart and the magnetic strength of the space within the coil. This last term has also been given a name. It is called the permeability, the unit of which is that of free space. The permeability of a certain piece of iron being 1,000, its magnetic strength is therefore 1,000 times that of air.

Effect of Frequency

The opposition offered by a coil of wire, such as the primary of a transformer, to the flow of an alternating current, is effected by one other quantity besides the inductance L, and that is the frequency. The greater the frequency, the greater is the opposition to the flow, because the magnetic field is being built up and torn down more rapidly.

Reactance

The combined opposition of the frequency and the inductance is proportional to their product, that is, to fL, where f is the frequency in cycles per second. The constant of proportion is 2π, so that the total inductive opposition is 2π fL, and is called the reactance, thus:

$$\text{Reactance} = 2\pi fL.$$

Use of π

The constant 2π is the circumference of a circle of unit radius. It is introduced here simply because L was originally defined in such a manner as to require it. The exact definition of L depends on the definition of a unit magnetic pole, which was defined as one which sends out one line of force per unit area at unit distance; the area of a sphere of unit radius is 4π, and hence a unit magnetic pole sends out 4π lines of force. It is evident that the introduction of this term is merely a matter of definition; no experimental phenomenon requires its presence.

The Henry

The unit of inductance L is called the henry, just as the unit of resistance is called the ohm and the unit of current is called the ampere.

Examples of the inductances of various common instruments are as follows: A certain telephone call-bell has an inductance of 1.4 henrys; a Bell telephone receiver 0.100 henry; a Morse relay 10.47 henrys with the armature against the poles and about 5 henrys under ordinary working conditions. The inductance of a dynamo field may vary from 1 to 1,000 henrys; the armature of a certain type of alternator having a capacity of 40 kilowatts showed a resistance of two ohms and an inductance of 0.035 henry. The primary and secondary windings of transformers measure from 0.001 henry to 50 henrys, depending on their capacity and voltage.

[*To be continued.*]

Note.—This serial was begun in the Western Electrician of October 3, 1908.

QUESTIONS AND ANSWERS

VOLTAGE AND FREQUENCY FOR HYDRO-ELECTRIC PLANT

A. W., Green River, Utah: I am planning the installation of a hydro-electric plant of 250 kilowatts capacity, also six miles of three-phase, high-tension transmission lines. Kindly advise me on the following points, taking into consideration all features bearing on the subject: (1) Would you advise generating at 1,000 volts and stepping up to 6,000 volts, or generating at 2,200 volts and stepping up to 6,000 volts, or to install a 6,000-volt machine? (2) As the current is to be used principally, but not altogether, for power purposes, would not 40 cycles be better than 25 or 60 cycles?

Answers

1. If the transmission voltage has been fixed at 6,000 volts, there is no reason why the generator should not develop 6,000 volts. Thus the initial cost and operating losses of a step-up transformer would be eliminated, which would more than offset a possibly greater initial cost in the generator due to its being smaller than standard sizes for that voltage. In the larger sizes generators for even higher voltages are now being commonly built.

2. For power purposes the lower frequencies give better results than the higher ones. Therefore 25 cycles would be even better than 40. For lighting, however, 25 is too low, as it has a tendency to produce flicker. In a number of systems 30 cycles has been found a good compromise value, especially where metallic-filament incandescent lamps are used. It is more nearly standard than 40 cycles and it would, therefore, be easier to get electrical equipment for that frequency than for 40 cycles.

SYNCHRONIZING WITH LAMPS

A. S., Oshkosh, Wis.: How are the synchronizing lamps connected to a three-phase system and how do they light when the machines are in synchronism?

Answer

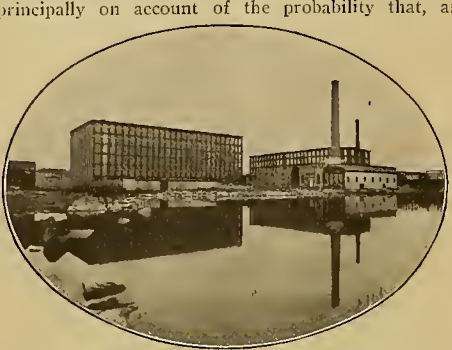
To synchronize a three-phase alternator to the station buses for the first time and to determine if the phases are properly arranged, connect the three machine leads through lamps to the station buses or leads of the alternator already in operation. Then, manipulating the field rheostat of the incoming machine until its voltage is about that of the buses, and varying its speed until the flickering of the lamps becomes very slow, all flashing simultaneously, throw in the switch, making the closure as nearly in the middle of the dark period as possible. If the three lamps or sets of lamps do not flash simultaneously but show a progressive flicker occurring in one circuit after another, the phases are wrongly connected and the leads must be interchanged until all lamps flash at the same time. After the machine is known to be properly connected from previous operation it is only necessary to synchronize one phase, in which case only two lamps or sets of lamps will be needed, connected as before. The operation of synchronizing in this case is similar to that described.

The National Electric Light Association has ready for distribution to its members the bound volume of the Proceedings of its thirty-first convention, held in Chicago, on May 19th to 22d, last. In this volume, which has a portrait of Dudley Farrand, the retired president, for a frontispiece, 834 pages are devoted to the complete reports, papers and discussions that engrossed the time of the convention. Lists of members and copious indexes are also included. The customary second volume devoted to the Question Box will not appear in that form this year, since the Question Box has been published from time to time in the monthly bulletin of the association.

STEAM-TURBINE PLANT OF THREAD MILLS AT FALL RIVER

In the early part of 1907 the American Thread Company decided to make an addition to its mills at Fall River, Mass. The power for the main mill was derived from an engine of about 1,600 horsepower, and the dye and gassing houses were driven by small engines, the power from these and the main engine being distributed throughout the various mills by belts and shafting.

It was decided to drive the new mill electrically, principally on account of the probability that, as

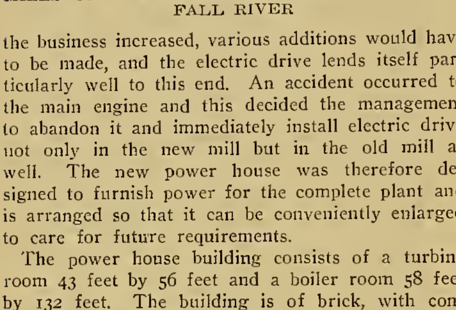


Power Plant at Water's Edge
MILLS OF THE AMERICAN THREAD COMPANY, FALL RIVER

the business increased, various additions would have to be made, and the electric drive lends itself particularly well to this end. An accident occurred to the main engine and this decided the management to abandon it and immediately install electric drive not only in the new mill but in the old mill as well. The new power house was therefore designed to furnish power for the complete plant and is arranged so that it can be conveniently enlarged to care for future requirements.

The power house building consists of a turbine room 43 feet by 56 feet and a boiler room 58 feet by 132 feet. The building is of brick, with concrete floors and roofs. The boiler room contains 12 horizontal tubular boilers, built by the Bigelow company of New Haven, Conn., each rated at 200 horsepower. These boilers are hung from beam supports and are brick set, the setting being arranged so that superheaters can be installed in the rear end. Three Foster superheaters have been installed. The hot gases from each battery of six boilers pass through a flue of a Green fuel economizer and thence to the chimney, or they can pass directly to the chimney. All of the boilers are arranged for burning low grades of fuel and are equipped with Parson blowers. A Webster open feed-water heater and purifier is located at the end of the boiler room next to the turbine room.

Feed water is delivered to the open heater and purifier and is then pumped to the boilers. The



INTERIOR OF POWER HOUSE OF THREAD MILLS AT FALL RIVER

feed-water main is so arranged that water can be supplied either from the pond or from the heater and purifier and delivered directly to the boilers or through the economizer.

The steam piping is arranged so that superheated or saturated steam can be supplied to the turbines or to the auxiliaries either separately or in conjunction. This arrangement was made primarily for use in testing the efficiency of the different types of apparatus. Drips from all of the high-pressure steam mains are collected at one point and from there returned to the boilers.

The turbine room has two floors, but the upper floor where the turbines are located does not extend over the space occupied by the pumps, which was left open so that the traveling crane could be utilized in installing and repairing the auxiliaries as well as the turbines. The turbine room contains two 1,500-kilowatt Allis-Chalmers alternating-current turbo-generators, two General Electric 75-kilowatt, direct-current turbo-generator exciters and a General Electric switchboard. This apparatus is located upon the upper-floor level.

The main turbines operate at 1,800 revolutions per minute with a steam pressure of 150 pounds, dry saturated, and a vacuum of 28 inches of mercury. Large temporary overload capacity has been provided for in the design of these machines; high efficiency is maintained and close regulation secured ever under the most unfavorable operating conditions. The speed of each turbine is regulated within close limits by a governor driven from the shaft through gears working in an oil bath. This governor, by means of a relay, operates a balanced throttle valve. The entire mechanism is so proportioned as to respond at once to variation of load, but its sensitiveness is kept within such bounds as to secure the best results in the parallel operation of the two turbo-generators. In order to provide for any possible accidental derangement of the main governing mechanism there is an entirely separate safety or over-speed governor. This is driven directly by the turbine shaft without the intervention of gearing.

The Allis-Chalmers revolving-field alternators driven by these turbines are of standard type, designed for high efficiency and safe operation at high peripheral speeds. For the purpose of obtaining adequate ventilation and for muffling the noise produced by the circulation of the air the turbo-generators are enclosed in such a manner that the air is taken in at the ends through fans mounted on the rotor shaft, which discharge it over the end connections of the armature coils into the bottom of the machine, whence it passes through the ventilating ducts of the core to an opening at the top.

On the lower floor of the turbine room are two engine-driven Lawrence centrifugal pumps for condensing water, one Blake 1,000-gallon Underwriters fire pump, one electrically driven Deane triplex power pump for sanitary water for the mills, one Fairbanks-Morse duplex steam pump for water supply to the heater and purifier, one engine-driven Deane triplex power pump and one Heisler duplex steam pump for boiler-feeding purposes.

The switchboard is located on the same floor as the turbines and consists of two panels controlling the exciters, two panels for the main turbo-generators, one panel for a Tirrill regulator, seven panels for the power circuits and one panel connected to the lighting circuits. The switchboard has a complete equipment of instruments and all switches are oil-immersed, except the main generator switches, which are solenoid-operated circuit-breakers. The feeder mains are carried underground to each mill through fiber conduits.

Taken all in all, the plant is very complete, being so designed as to secure both maximum economy and low operating costs. The plans for it were made and its construction superintended by S. M. Green, consulting engineer, of Holyoke, Mass.

CHICAGO TRACTION REHABILITATION

[*Continued from page 325.*]

third Street, will have a similar equipment, while the new sub-station at Forty-second Street and Wabash Avenue will contain seven 2,000-kilowatt units, thus giving a total capacity of 37,200 kilowatts in rotaries. All these stations are equipped with standard General Electric apparatus throughout. Single-phase, step-down transformers of 750 kilowatts each are provided with air blast, as are the 300-kilowatt reactances. Below the transformers and reactances is a large air chamber and a battery of motor-driven ventilating fans. In this chamber are placed the high-tension bus-bars and incoming lines, as well as the high-tension, potential and current transformers.

Only one sub-station has been so far provided by the Chicago Railways Company It is in a former cable power house at Van Buren and Jefferson streets, and is likewise supplied with 9,000-volt, three-phase current by the Commonwealth Edison Company. Its present equipment consists of three 2,000-kilowatt rotaries, but it will ultimately have six.

The increase in amount and size of rolling stock has necessitated the reconstruction and enlargement of practically all the car houses operated by the companies. As far as possible these are to be fireproof and provided with sprinklers to minimize the danger of recurrence of the frequent loss of rolling stock by fire. A number of the houses are double-ended to permit handling of the cars with less interference and greater speed and to economize in room required. A number of these houses have been completed.

After a study of the types of cars in use in large cities, the Board of Supervising Engineers recommended the gradual introduction of the pay-as-you-enter cars that had been successfully used in Montreal. On November 24, 1907, the Chicago City Railway Company introduced a few of them into service on the Indiana Avenue line, which was the first time they had been used in this country. Their success in reducing accidents, promoting the comfort of passengers, increasing the speed and reliability of service and in insuring the collection of all fares has been noteworthy from the start. Fears that they would congest traffic in a large city have been found groundless, and, in fact, their satisfactory results as a whole have brought a determination to use them over the entire city. The cars are all high-power double-truck cars and are fully equipped for comfortable and rapid transit. The Chicago City Railway Company is rebuilding its 805 double-truck cars into the pay-as-you-enter pattern as rapidly as its large shops can do so. The Chicago Railways Company has contracted for 650 new cars of this type at a total cost of about $4,000,000. Fifty of them will be put into service on the Madison Street line on November 1st, and they will be delivered in batches of fifty as quickly as the Pullman Car Company can complete them. They are said to be the finest cars ever put into city traction service.

The scope of the street-car system of Chicago may be gained from the following figures submitted for the combined service of both companies at the time of the last annual report of the supervising engineers.

Number of employes, 10,886.

Wages paid to employes, $9,040,396.

Passengers carried for revenue, 372,123,199.

Passengers carried for transfers and free, 246,177,067.

Total passengers carried, 618,300,266.

Average earnings per passenger carried, 3.036 cents.

Average expense of hauling each passenger carried, including 5 per cent. interest on agreed valuation of properties, 2.578 cents.

Average profit per passenger carried, 0.458 cent.

Based on these figures the board has made the following calculation of what becomes of each nickel paid in fare:

Paid in wages to employes	2.24
Paid for material, supplies and other expenses incident to the maintenance, operation, and management of the railways	1.14
Paid for taxes	.12
Interest on value of properties	.75
Profit paid to the railways	.34
Profit paid to the city	.41
Total	5.00

Although exactly half of the rehabilitation period of the Chicago City Railway Company was passed on the 15th of this month, there had been completely reconstructed on its lines 71.43 miles of single track, which was over 73 per cent. of that required for the full three-year period. At the same time there had been completed 59.89 miles by the Chicago Railways Company, although but 8½ months of its rehabilitation period had passed.

Besides the reconstruction work and building of new lines on the two main systems, considerable work has been mapped out recently in the southeastern part of the city on the lines of the lately reorganized Calumet and South Chicago Railway Company in accordance with its new franchise requirements. This work will involve not only rebuilding of tracks and provision of sub-stations but also much needed re-equipment of cars and systematic routing of lines.

The Popo Agie Power, Fuel and Oil Company of Cheyenne, Wyo., capital stock $1,000,000, has filed articles of incorporation and proposes to construct a large power plant near Lander and generate power through the burning of crude oil. This company will be a rival of the Big Horn Power Company, which is building a plant to generate 10,000 electric horsepower from the flow of the Big Horn River at a point near where the oil-power plant will be located.

ELECTRIC MOTORS IN A LEAD FACTORY

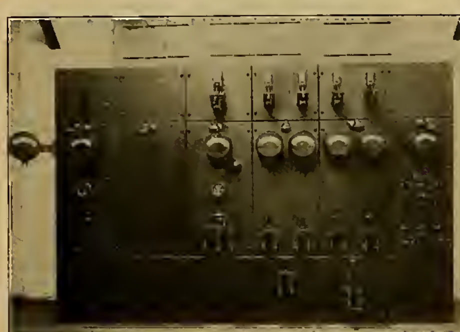
The new factory of the Raymond Lead Company at the corner of Washtenaw and Lexington streets, Chicago, is without question the most modern lead works in the West. Motor-driven throughout, the factory is another example of the increasing applications of electricity for industrial purposes. The new plant, which occupies an area of 436 by 110 feet, or about 48,000 square feet, was but recently finished and the lead company took over the buildings and equipment on September 1st.

As the site of the plant was not accessible to existing electric power distribution, an isolated electric plant was decided upon and a 220-volt direct-current generating system was installed. Parker boilers supply steam to two Fleming side-crank en-

Typical Motor Installation

Distribution Box and Conduit

Direct-connected Generating Unit



Switchboard

ELECTRICAL EQUIPMENT IN A LEAD FACTORY

gines direct-connected to a 150-kilowatt and a 50-kilowatt Allis-Chalmers 220-volt direct-current generator, respectively.

The switchboard is provided with three generator panels, including a spare for a future unit. The power supply to the factory is carried through four separate panels, equipped with circuit-breakers, switches and ammeters, corresponding to the four departments served, for calculating the power consumption when necessary. The lighting system is handled by a separate panel, arranged, as are the generator panels, with ammeter, circuit-breaker, switches, etc. Separate power cables are carried to each department, the wires being laid underground in concrete from building to building.

The largest piece of electrically driven machinery in the lead works is the billet mill, where huge blocks of lead are passed successively through steel rolls and pressed out into long sheets of any desired thickness. This mill is driven by a 75-horsepower Westinghouse motor running at 150 revolutions per minute and controlled through automatic relays from the operator's master-switch. The mill is mounted on a heavy concrete foundation and is connected by gears to the motor, which rests on the basement-floor level. For raising and lowering the top roll a 1½-horsepower Allis-Chalmers motor is mounted on the mill.

For removing the lead sheets from the cutting table a jib-crane of 12-foot radius has a Sprague one-ton hoist mounted at its extremity. The motor is supplied with current through a pair of brushes and slip-rings on the mast. A Northern 7½-ton three-motor traveling crane, which runs the length of the lead-roll room, is used to carry the billets from the pouring mold to the rolls. As the basement floor is below the sewer level, pumping has been resorted to. Two Yeoman sump pumps, each having a capacity of 100 gallons per minute, are driven by Century single-phase, alternating-current motors supplied from the lighting circuit of the Commonwealth Edison Company. These pumps are automatic float-controlled, and are often required to work when the factory power plant is shut down.

Hydraulic pressure of several thousand pounds for the lead-pipe machines is supplied by two 50-horsepower Allis-Chalmers motors belted to the reducing gearing which drives the pistons of the high-pressure pumps. The presses for making lead pipes and traps of various sizes are thus all indirectly electrically operated. A 10-horsepower motor drives a number of small machines in the specialty room, where the various operations incident to the making of paint tubes and other small tin, lead and brass articles are performed. A 10-horsepower motor in the carpenter shop operates a number of pieces of woodworking machinery.

In the brass foundry a 7½-horsepower Allis-Chalmers motor, through local shafting, drives a casting rattler, a shear and several emery wheels. Instead of piping the foundry for compressed air, branch power outlets were run at convenient places and a portable air-pump and reservoir outfit with a cable enables compressed air to be obtained for any purpose. The 10-horsepower Allis-Chalmers motor is controlled by a pressure switch, and the whole outfit of motor, pump and reservoir is compactly mounted on a truck. An interesting magnetic separator is used in this department to separate any iron from the brass chips, which are returned to the melting pot. The material passes slowly down a broad chute over which rotates a wheel with iron pole-pieces excited by a large electromagnet above. Any foreign iron, which would impair the quality of the brass, is thus caught up out of the brass and carried to one side.

In the entire installation there are 24 motors, aggregating 350 horsepower. The lighting equipment comprises 63 type K and 24 type H Cooper Hewitt mercury-arc lamps, 170 incandescent lamps and five outdoor arc lamps.

The switchboards and cabinets were furnished by the Eaton Electric Manufacturing Company, 144 East Erie Street, Chicago, and electrical wiring and construction was done by the Lounsbery Brothers Company, 702 Plymouth Building, Chicago.

HIGH-PRESSURE FIRE PUMPING SYSTEM FOR CHICAGO

Chicago's department of public works has completed plans for a high-pressure water system, which will cost about $2,500,000, for the district bounded by Chicago Avenue, Halsted and Twelfth streets. It is hoped to have work started on the system within 12 months. The announcement of the plans was made following the return of Fire Marshal Horan, Thomas T. Johnston, of the city engineer's bureau, and Nathan William MacChesney, representing the downtown business interests from New York, where they saw a public demonstration of the high-pressure system there. For pumps and motors to give a high-pressure system in the area defined there will be needed about $500,000, and about $2,000,000 for new water mains. One pump would be located at Twelfth or Fourteenth Street, another at Harrison Street and a third on the North Side.

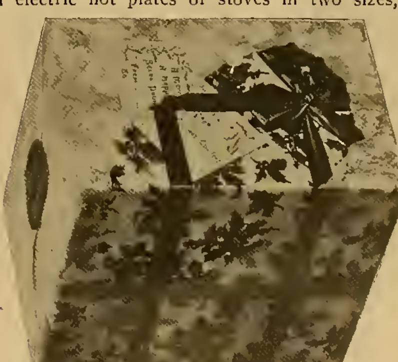
SMALL MOTORS IN NUREMBERG

Nuremberg, in common with the larger number of German cities, operates its own street-railway lines and its electric-light and gas plants, and in recent years has undertaken to furnish power to small manufacturing or other concerns. The number of motors now exceeds 1,000, practically all of which are inside the city limits. These motors are for the most part small, furnishing at the close of 1907 a total of 2,369 horsepower, or an average of 2.6 horsepower per motor. The city charges 20 pfennigs (4.76 cents) per hour per horsepower for smaller motors and 18 pfennigs (4.28 cents) per hour per horsepower for large motors. The user pays for connections with street wires and for the use of meter, the charges depending on the amount of power used and other conditions.

ELECTRICAL CHRISTMAS PRESENTS FOR LADIES

Those who like to surprise mother, wife or sister with a Christmas present that is out of the ordinary will find something entirely different in the line of Christmas packages put up by the Westinghouse Electric and Manufacturing Company, containing useful electrical appliances. These packages are wrapped in handsome holly paper and tied with red ribbon, and then rewrapped in transparent paper, through which the colors are visible.

Such articles as sewing-machine motors, flatirons and electric hot plates or stoves in two sizes, are



ELECTRICAL CHRISTMAS PRESENTS FOR LADIES

put up in this manner. The five-pound package is 5¾ inches wide, eight inches long and 7¾ inches high. The seven-pound package is six inches wide, nine inches long and eight inches high.

Each package carries an appropriate card and label conveying the wishes of the season and provided with a space in which the donor may write his name and the name of the person for whom the package is intended. The packages will present a handsome appearance upon the shelves of the dealer or in the show-window. They are packed for shipment in such a manner as to protect the wrapping from damage.

CLEVELAND THREE-CENT FRANCHISE DEFEATED

The franchise under which the Municipal Traction Company of Cleveland, Ohio, is operating the local street-railway lines on a three-cent fare basis was defeated October 22d by a majority of 879 in the referendum vote. The total vote cast was upward of 75,000. The defeat of the franchise may mean that the railway property will revert to its original owners and that the old rate-of-fare strife which lasted seven years will be renewed. The only alternative will be for the City Council at once to grant a new franchise, which will save the property to the Municipal Traction Company.

The vote came as the climax to the general street-railway contest which has been waged for years, with three-cent fare and ultimate municipal ownership as the goal of the city administration. This was constantly opposed by the old Cleveland Electric Railway Company, which had been charging a five-cent fare. During the progress of the strife a new company, the Forest City Railway Company, fostered by the city, began the operation of cars over a few competing lines on a three-cent basis.

The settlement finally came under an agreement to consolidate the two companies and lease the property to an operating company, the Municipal Traction Company, which agreed to make the general fare within the city of Cleveland three cents. Accordingly, a new company, the Cleveland Railway Company, was organized to take over the consolidated properties. Under the agreement a 25-year franchise was granted to the Cleveland Railway Company. Then the property and franchise was leased to the Municipal Traction Company for 99 years upon the condition that the operating company protect the property and pay a rental equal to six per cent. dividend upon the stock of the Cleveland Railway Company, a $30,000,000 corporation. It has been during only the past three months that the operating company has had a surplus.

A temporary receiver for the Municipal Traction Company was asked in a petition filed in the Federal court Friday of last week by Fred L. Taft, attorney for the Ingersoll-Rand Company. An official of the Municipal Traction Company is quoted as saying that his company was willing to concede the defeat of the security grant, and turn back the street railway property to the Cleveland Railway Company, provided that the latter would restore the original three-cent fare lines to their former owners.

DEATH OF DR. PERRINE

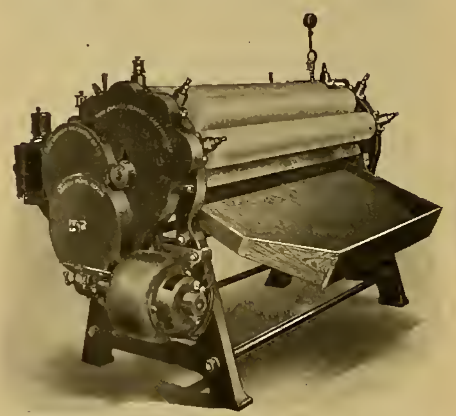
Frederic A. C. Perrine, D. Sc., one of the leading electrical engineers of the country and an authority on long-distance power transmission, particularly line construction, died at his home in Plainfield, N. J., last week. He was 46 years of age. He graduated from Princeton with the degree of B. A. in 1883, and earned the degrees of D. Sc. and A. M. in 1885 and 1886, respectively. He was manager of the insulated-wire department of John A. Roebling's Sons Company from 1889 to 1892 and treasurer of the Germania Electric Company in 1892 and 1893. For seven years thereafter he was engaged in educational work, being professor of electrical engineering in Leland Stanford, Jr., University of California. During part of this time he was chief engineer of the Standard Electric Company. Dr. Perrine was president of the Stanley Electric Manufacturing Company of Pittsfield, Mass., from 1900 to 1904. Since the latter date he had been a consulting electrical engineer, with office in New York city.

As an engineer Dr. Perrine was one of the first to realize the possibilities of long-distance power transmission from hydro-electric plants. He boldly advocated high voltages when it took courage to do so, and he had much to do with designing the insulation and line construction of the celebrated Bay Counties plant in California. At the International Electrical Congress at St. Louis in 1904 Dr. Perrine was a delegate from the National Electric Light Association and the Pacific Coast Transmission Association. His paper on "American Practice in High-tension Line Construction and Operation," read before the Section on Electric Power Transmission, was an able résumé of the subject, such as he was well qualified to make. Dr. Perrine had a good command of English and contributed occasionally to the technical press, with which he was also connected in an editorial capacity in former years. He was highly esteemed by his colleagues, who will extend to his wife (a daughter of Mr. F. W. Roebling) and daughter their sincere condolences.

SCHENECTADY SECTION OF THE INSTITUTE

The first meeting of the Schenectady Section of the American Institute of Electrical Engineers for the season of 1908 was scheduled to be held on Thursday evening, October 29th, when Dr. E. W. Rice was to tell of the pioneer developments within the General Electric Company.

Dr. Rice has been connected with the General Electric since its formation, and was earlier with the Thomson-Houston Electric Company, now affiliated with the General Electric Company. In connection with his work with the Thomson-Houston Company Dr. Rice was largely instrumental in the development of the various types of machinery which are now used in the electrical industry. It is interesting to consider the difficulties met with in these developments—difficulties which the engineer at present hardly realizes, when with the much more perfect instruments now available, it is a relatively easy matter to determine the phenomena which occur. The earlier



MOTOR-DRIVEN COLLAR AND CUFF IRONER

developments were not only of the machines themselves, but of instruments as well, to determine the efficiency and practicability of the machines.

On November 5th, 12th and 19th, Dr. C. P. Steinmetz will give a series of lectures on "Thermodynamics." These lectures are sure to be of special interest because of the growing importance of steam work in connection with electrical developments.

All of the above lectures will be of great value and doubtless the majority of the local members, appreciating the fact, will attend all of the meetings. An extremely interesting course of lectures has been arranged for the entire season. In addition to those named, others have been arranged for.

One illustrated lecture will be given covering the various developments of incandescent lamps, and another covering the various types and developments of arc lamps. Two lectures will be given on the principles and design of alternating-current commutating motors, and one lecture on alternating-current induction motors. One or possibly two lectures will deal with direct-current generators and compensating windings. The difficulties met with in heavy railroading, in design and apparatus to take care of high voltages and large powers, will be dealt with in two lectures. An illustrated lecture on the various kinds of radiation, and a series of lectures on light will be given. Lectures will also be arranged for to cover gas turbines, rotary compressors and factory organization.

The Schenectady Section of the American Institute of Electrical Engineers constitutes the largest local section of the Institute, and its progress from year to year has strikingly indicated Schenectady's interest in electrical and other engineering problems.

The officers and committees appointed for the season of 1908 are as follows: Honorary chairman, C. P. Steinmetz; chairman, E. J. Berg; treasurer, E. D. Dickenson (acting treasurer, G. R. Parker); secretary, M. O. Troy; assistant secretary, R. H. Carlton.

Executive committee—E. J. Berg, chairman; C. P. Steinmetz, D. B. Rushmore, M. O. Troy.

Meetings and papers committee—M. O. Troy, chairman; T. A. Worcester, C. L. Proctor, E. B. Merriam, R. H. Carlton.

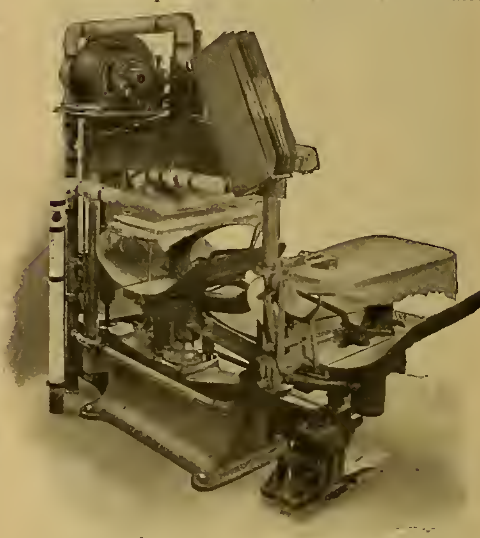
Finance committee—J. W. Upp, chairman; C. W. Stone, H. G. Reist.

Membership committee—E. W. Allen, chairman; F. L. Kemp, E. Karow, J. A. Seede, H. Maxwell, E. E. Kimball.

Entertainment committee—A. B. Lawrence, chairman; A. V. Thompson, F. E. Cuddeback, C. H Hill.

ELECTRICALLY DRIVEN LAUNDRY MACHINERY

An objection to machine laundry work seems to be a feeling that machinery means dirt. This is largely true where the machinery is driven by belts. The shafting and countershafting collect dirt and dust produced by the belts, and throw it into the air. By using electric motors to drive the machines the production of this dirt is eliminated.



MOTOR-DRIVEN BOSOM PRESS

The accompanying cuts show that motors can be connected in such a way that there are no exposed belts or gearing, so that no dirt is produced from this source.

There are other advantages obtained by motor drive for this class of machinery. The machines can be arranged in any place and in any position, regardless of line shafting. This means that more machinery can be installed in a given space, because with shafting the machines must be arranged more or less in a straight line, and space is often wasted. A great saving of power is also effected, as the electric motor draws from the line only the amount of power required to drive the machinery. It is often desirable to run a part of the plant without the other part. This can be conveniently done when each machine is motor-driven, whereas with belt drive all of the shafting in the plant must be run, in which case the power taken to drive the shafting is often more than the power required to drive the few machines which are running.

The motor applications shown were made by the Crocker-Wheeler Company, manufacturer of electrical machinery, of Ampere, N. J., in the motor business over 20 years, making a specialty of motor applications. Motors are built in all sizes from one-tenth horsepower up to the largest, and complete data can be furnished on the power required to drive all classes of laundry machinery. The Crocker-Wheeler form L motor, shown on the ironer, is of especially rugged and efficient construction.

The October meeting of the Pittsburg Section A. I. E. E. at the Carnegie Institute was devoted to the presentation and discussion of two original papers, "The Oscillograph and Some of Its Uses," by H. H. Galleher, engineer of the high-tension testing laboratory of the Westinghouse Electric and Manufacturing Company, and "The Testing of Large Alternating-current Generators," by L. E. Schumacher, of the dynamo testing department of the same company. The papers were illustrated by lantern slides. The next meeting will be held early in November, the subject to be "Electricity in Mines," by George R. Wood, consulting engineer.

SHUNTED-MOTOR CONTROLLER CASE

In the patent suit of the General Electric Company, complainant and appellant, against the Morgan-Gardner Electric Company, defendant and appellee, the United States Circuit Court of Appeals for the Seventh Circuit has handed down a decision in the appellant's favor, directing a decree to be entered for an injunction and an accounting. The General Electric Company brought suit for alleged infringement of certain claims of patents Nos. 587,441 and 587,442, both issued on August 3. 1897, to Knight and Potter, one for a "regulating apparatus for electrically driven mechanism," and the other for a "method of regulating electrically driven mechanism." Its contention was not upheld by the court below, however. But in a prior suit in another court the same claims were held valid and infringed by the device manufactured by the defendant. The Court of Appeals for the Seventh Circuit follows this precedent and finds for the complainant and appellant, failing to sustain some technical points raised by the defendant. The invention, so far as it is covered by the claims in suit, consists in the means and method of changing from series to multiple by shunting one of the motors, while protecting the other by resistance in series with it, and then breaking the circuit of the shunted motor and arranging it in parallel with the other.

ANALYSIS OF A HYDRO-ELECTRIC PROJECT [1]

By H. von Schon

The analysis of the hydro-electric power project should be initiated by that of the market for its product. Name me a city in the United States which does not enjoy the advantages of efficient and economical power current, and I can lead you to the waterpower from which it can secure both. Many an apparent waterpower opportunity must be classed as impracticable today because there is too much water at times; the flood flow eliminates the practicable normal-flow development program, while its reasonable conservation would render it of the greatest power-opportunity value.

The most complete recent investigation of the cost of power from steam plants with coal, gas or oil fuels, and the continuous output at various load factors, has been concluded during the past year by the Hydro-electric Power Commission of Ontario, Canada. The territory covered by this inquiry compares well, industrially speaking, with any in the United States, with the exception of New England; the cost of plants and of operating will be lower than those for like plants on this side, and the application of these data for this discussion will therefore err on the side of safety. The cost of steam plants includes that of boilers and piping, engines of simple non-condensing type up to 50-horsepower rating and of compound condensing for larger capacities, of installation of the engine and the accessories, engine foundation, boiler setting and chimney, building, coal storage and land. The loss from brake horsepower to the main mechanical drive or belt-driven generator is taken at 10 per cent. and the resulting cost is for the mechanical or electric horsepower delivered to the factory or shop; the further loss from main drive to individual machine or motor being indeterminable for general treatment.

Table 1.—Cost of Power Plants Per Horsepower.

Horsepower.	10	30	50	100	300	500
Steam..........	$132.00	$130.00	$113.00	$105.00	$80.00	$73.00
Prod. gas......	204.00	110.00	100.00	90.00	87.00	77.00
Illum. gas......	72.00	59.00	53.00	50.00	....	....
Gasoline.......	80.00	60.00	58.00	50.00	....	....
Oil........ ...	90.00	70.00	68.00	60.00	....	....

The operating cost of plants has been compiled with an interest charge of five per cent., but no charge has been made for water; surface condensers have been assumed, and the working cost has been based on steady loads and efficient operation. If the load fluctuates, fuel consumption and cost would increase above that herein stated. Depreciation of equipment is rated at six per cent., of buildings at two per cent., insurance at one per cent., taxes 1½ per cent., bituminous coal at $3.25 per short ton, anthracite for producer-gas plant at $5 per ton, gasoline at 20 cents, and oil at 16 cents per gallon, illuminating gas at 75 cents, and natural gas at 20 cents per 1,000 cubic feet. The load factor is taken at 75 per cent. of the rated brake horsepower engine capacity; the cost is given for 6,600 and 3,000 hours per year operation in dollars per year and in cents per horsepower-hour.

Applying these cost and operating estimates to the inventory of power plants in the market under investigation, some conclusions can be drawn as to the power rate which can secure this business. Power current is sold at a flat rate per horsepower-year or at a meter rate per kilowatt-hour. Considering the case of a customer operating a 300-horsepower steam plant operating 10 hours per day, and ascertaining the mode of power application to the individual machines, as well as the probable working load factor, that is, the actual time during the day the tools or machines are running, the above rated horsepower-year cost of $46 will have to be increased by probably not less than 10 per cent. for the loss in taking the power from the main drive to the individual machines and another 10 per cent. for the non-operating period of the machine, which would bring the working power cost to $55. This customer should be interested by a $35 or $40 horsepower-year rate, or still more, by a meter rate of 1¼ cents per kilowatt-hour, which would make his power cost, for a continuous 10-hour operation for 308 days, $38.50. As a matter of fact, that particular motor would serve current only for part, say, 75 per cent. of that time, and the annual power cost to operate that machine would stand the customer at $28.87, probably, just about half of what it costs him with his steam plant. Or, taking a machine shop with a 50-horsepower steam plant, operating 10 hours per day, the power cost given in Table 2 is $89, and it will be considerably higher with losses in sub-drives and idle tools; a rate of 2½ cents per kilowatt would make his continuous power $77, and 75 per cent. of that, representing probably the actual working load, would be $57.75, also about half of what the steam power costs.

Table 2.—Operating Cost Per Year and Per Horsepower Per 1,000 Hours.

		Horsepower.					
		10	30	50	100	300	500
Steam	6600 hrs	$353.00	$194.00	$167.00	$120.00	$85.00	$73.00
		5.35	3.00	2.53	1.80	1.30	1.10
	3000 hrs	180.00	103.00	89.00	74.00	46.00	41.00
		6.00	3.40	2.96	2.43	1.53	1.36
Nat. Gas..	6600 hrs	68.00	47.00	40.00	36.00	32.00	32.00
		1.30	0.70	0.60	0.55	0.50	0.50
	3000 hrs	38.00	27.00	24.00	21.00	19.00	19.00
		1.26	0.90	0.80	0.70	0.63	0.63
Prod. Gas.	6600 hrs	152.00	87.00	71.00	62.00	53.00	49.00
		2.45	1.30	1.10	0.90	0.80	0.75
	3000 hrs	92.00	52.00	43.00	38.00	34.00	30.00
		3.66	1.73	1.40	1.30	1.13	1.00
Ill. Gas...	6600 hrs	180.00	151.00	136.00	126.00	......	......
		2.70	2.30	2.00	1.90	......	......
	3000 hrs	90.00	74.00	67.00	62.00	......	......
		3.00	2.50	2.23	2.06	......	......
Oil........	6600 hrs	233.00	192.00	187.00	......	......	......
		3.50	2.90	2.80	......	......	......
	3000 hrs	115.00	94.00	92.00	......	......	...
		3.50	3.10	2.90	......	......	......

The preponderance of power service is of small units, of three, five and 10 horsepower; the cost of the latter appears in Table 2 as $180 per year of 3,000 hours, and it may be stated as a rule that it is generally greater than this; five cents per kilowatt-hour, makes the 100 per cent. load factor, 10-hour service, $154. Now, 75 per cent. of this is $115, also probably about half the actual steam-power cost. Tables 3 and 4 bring the cost and rate topic down to their practical application in analyzing the former and adapting the latter. Table 3 gives the kilowatt rate in cents, which is equivalent to the cost of steam power applied to the machine, the working power, the loss from the main to sub-drives is taken at 10 per cent., and that of the idle machines likewise.

Table 4 gives the fuel consumption of all kinds per horsepower-hour, and year, and from this the proper corrections can be made for fuel costs, which differ from those given in Table 1, as assumed for operating costs, quoted in Table 2.

Table 5 gives correction to steam-power cost for 10 cents difference in coal cost above or below $3.25 per ton.

Table 3.—Kilowatt-hour Rates Equivalent to Steam-power Cost.

		Horsepower.					
		10	30	50	100	300	500
Steam........	6600 hrs	9.0c	4.8c	4.1c	3.0c	2.1c	1.8c
	3000 hrs	9.9c	5.5c	4.9c	4.0c	2.5c	2.2c
Producer Gas	6600 hrs	3.8c	2.1c	1.7c	1.5c	1.3c	1.2c
	3000 hrs	5.0c	2.8c	2.3c	2.1c	1.9c	1.6c
Natural Gas.	6600 hrs	1.7c	1.2c	1.0c	0.9c	0.8c	0 7c
	3000 hrs	2.1c	1.5c	1.3c	1.1c	1.0c	1.0c
Illum. Gas...	6600 hrs	4.5c	3.8c	3.3c	3.1c	......	......
	3000 hrs	4.9c	4.1c	3.6c	3.4c	......	......
Oil..........	6600 hrs	6.0c	4.8c	4.5c	......	......	......
	3000 hrs	6.3c	5.2c	5.0c	......	......	......

One-tenth of a cent per kilowatt-hour of 6,600 and 3,000 hours equals 4.92 and 2.24, respectively, per working horsepower per year.

Table 4.—Fuel Consumption Per Working Horsepower-year at 75 Per Cent. of Rated Capacities.

		Horsepower.					
		10	30	50	100	300	500
Steam Coal....	lbs. per B. H. P. hr.	14.00	8.50	8.00	5.75	4.50	4 00
	tons per 6,600 hrs.	508	924	1452	2087	4900	7260
	tons per 3,000 hrs.	231	420	660	948	2227	3300
Prod. Gas. Anth. Coal	lbs. per B. H. P. hr.	1.45	1.33	1.25	1.15	1.15	1.15
	tons per 6,600 hrs.	53	145	228	405	1254	2085
	tons per 3,000 hrs.	24	66	103	189	570	948
Illum. Gas 600 B.T.U.	c. ft. per B. H. P. hr	25	23	21	20	.....	.....
	1,000 per 6,600 hrs.	1815	5000	7620	14520	.....	.....
	1,000 per 3,000 hrs.	736	2277	3465	6600	.....	.....
Nat. Gas.. 980 B.T.U.	c. ft. per B.H.P. hr.	16	14	13	12	12	12
	1,000 per 6,600 hrs.	1161	3050	4720	8712	23936	43560
	1,000 per 3,000 hrs.	528	1386	2145	3960	11880	19800
Gasoline..	pints per B.H.P. hr.	1.3	1.1	1.1	.....	.....	.....
	gals. per 6,600 hrs.	11800	29700	49500	.....	.....	.....
	gals. per 3,000 hrs.	5360	13500	22500	.....	.....	... .

Table 5.—Corrections to Operating Cost of Table 2 Per 10 Cents in Price of Coal Above or Below $3.25 Per Ton.

Horsepower.	Working H. P per Year.	Equivalent K. W. Hour.	Hours per Year.
10...........................	$6 27	0.1 cent	6,600
	2.85	0.13 cent	3,000
30...........................	3.80	0.064 cent	6,600
	1.70	0.08 cent	3.000
50...........................	3.58	0.06 cent	6,600
	1.63	0.073 cent	3,000
100...........................	2.58	0.044 cent	6,600
	1 17	0.05 cent	3,000
300........................ ...	2.02	0.034 cent	6,600
	0.91	0.04 cent	3,000
500...........................	1.80	0.03 cent	6,600
	0.81	0.035 cent	3,000

From Tables 2 and 3 the case of a 100-horsepower 3,000 hours per year steam plant is thus analyzed:

Power delivered to main drive......100 horsepower
Power delivered to machine........ 90 horsepower
Power actually working, 10 per cent. delay .... 81 horsepower

Cost of work, horsepower from $\frac{\$7{,}400}{0.81}$ is $91.36.

Eighty-one horsepower for 3,000 hours is 181,278 kilowatt-hours.

The kilowatt-hour rate from $\frac{\$91.36}{181{,}278}$ is five cents.

At a rate of 2½ cents, the cost of 181,278 kilowatts-hours is $45.32.

The electric power at this 2½-cent rate costs the customer about half of what the steam power would amount to, while all the other advantages to his mill or shop, to the arrangement of the operating process, the absence of the noise from mechanical drive, and all those already detailed are his without further cost.

If the cost of coal is $2.25 instead of $3.25, as assumed for Table 2, the cost of machine horsepower is $91.36 less $1.17 \times 10 = \$79.66$, and the equivalent kilowatt rate is four cents less $0.05 \times 10 = 3\frac{1}{2}$ cents. Of a 50-horsepower plant operating 3,000 hours, coal costing $3.25, the cost of machine horsepower is from $\frac{\$89 \times 50}{40.5} = \$109.87$.

40.5 horsepower for 3,000 hours is $40.5 \times 746 \times 3{,}000 = 90{,}639$ kilowatt-hours, the equivalent kilowatt-hour rate being from $\frac{\$89 \times 50}{90{,}630} = 4.9$ cents.

With the cost of coal at $2 per ton, the kilowatt rate is from 4.9 less $0.073 \times 12.5 = 4$ cents. Or, of a 300-horsepower plant operating 3,000 hours with coal at $3.25, the cost of machine horsepower is from $\frac{\$46 \times 300}{243} = \$56.79$, 243 horsepower for 3,000 hours is from $243 \times 746 \times 3{,}000 = 543{,}834$ kilowatt hours, and the equivalent kilowatt-hour rate is from $\frac{\$46 \times 300}{543{,}834} = 2.5$ cents, while with coal cost at $1.75 per ton the kilowatt-hour rate is from 2.5 less $0.04 \times 15 = 1.9$ cents.

In this wise each existing power should be analyzed and the case placed before its owner. It will make an impression, the customer will begin to look very seriously into this subject of power cost and if the quoted facts are corroborated by him, or nearly so, he will arrange to substitute the electric-power drive just as soon as his conditions will permit him to do so. There will be no need of canvassing him any further, he will come after that electric-current contract without solicitation, because he is in business to make dollars, and he will not knowingly waste any. The great majority of power customers are those operating small-unit plants, and the small plants represent the most desirable power loads for the central plant, because the load-factor fluctuations of 10 plants of 10-horsepower capacity will practically balance them-

1. Extracts from a paper presented by the author, formerly chief engineer of the Lake Superior Power Company and now a consulting engineer of Detroit, before the Western Society of Engineers, Chicago, September 2, 1908.

selves; a total of 80 to 85 horsepower will probably serve them at all times during the 10-hour-day operating period. But the one 100-horsepower plant will run full at short periods, though in the aggregate it will not consume any more current than the ten 10-horsepower plants, although the full 100-horsepower output must be kept available for this customer, but the earnings from this 100-horsepower will be no more than those from the 85 horsepower kept on hand for the use of the 10 small plants. And this may be still further detailed when two, three and five-horsepower plants are considered. At any rate, the small power consumer is the important factor in this market analysis, and there are plenty of them in every community. In fact, there is no establishment, private, public, business or manufacturing, which cannot use electric power in one way or another to economical advantage, and the present-day motor application reaches a great multitude of such wants for the operation of a great variety of machines.

The power-load inquiry is the principal feature of the market analysis, the lighting load is secondary to it. No hydro-electric project should be pronounced a safe business enterprise unless the visible power-load revenue will meet the charges; the night-load revenue, from the lighting business, should be considered as a net surplus.

Transmission equipment is made up of the line and transformers. Hydro-electric current is generally transmitted a considerable distance in order to find a suitable market. The limitation of distance lies only in the cost of the equipment and the value of the energy lost during transmission. The transmission loss is controlled by the current quantity, the pressure and the distance; there is no limit to practical pressure or voltage, and therefore, with sufficient current, there is no limit to distance, at least not within the practical scope of this discussion. A safe, though arbitrary, rule is that the current should aggregate 15 kilowatts per 1,000 feet of transmission distance, or about 80 kilowatts per mile; that the pressure should not be less than 5,000 volts for any distance, with 500 volts additional, for every mile exceeding five. The observance of these will keep the economical loss within seven per cent. for transmission distances up to 25 miles and within nine per cent. up to 100 miles, while the transmission cost will approximate $25 per kilowatt, being a charge of about 0.2 cent per kilowatt-hour on a 3,000-hour, annual-operation period; this represents charges of investment, maintenance, depreciation and operation, with the price of copper taken at 15 cents per pound.

LARGE HYDRO-ELECTRIC DEVELOPMENT IN NORWAY

Consul-general Henry Bordewich, writing from Christiania, sends the following information of large waterpower enterprises in Norway:

Two bills were lately laid before the Norwegian Congress to the effect that a German company, the Badische Anilin und Sodafabrik, shall be granted permission to acquire the Tyin and Matre watercourses in Bergensstift, West Norway, with the aim of developing these watercourses for a delivery of 60,000 to 70,000 horsepower. Among the conditions may be mentioned that the company is to pay yearly to the state one krone (26.8 cents) per horsepower beyond the 10,000 horsepower which the watercourse is supposed to supply in its natural state while undeveloped. The company is not allowed to raise the price of electric energy within the kingdom, and is bound to supply 500 horsepower for public use at a yearly rate of 30 kroner. The work of development shall be commenced within five years and completed within 12 years; for the former period the company is permitted to employ foreign engineers and workmen to such extent as it deems necessary, although the ordinary conditions as to Norwegian employes and Norwegian material are laid down as the essential rule. After the expiration of 75 years both plants shall revert to the state. The powers will be employed for the production of chemicals, for melting works for iron ore, and for other industries. The plants when completed are calculated to cost about $12,000,000.

BOOK TABLE

Western Electrical and Gas Directory. San Francisco: Blanchfield Publishing Company. 1908. Pp. (5¼ by 7¾ inches), lxv., 224. Price, $10.

The latest edition of Blanchfield's directory of the electrical and gas industries of the Pacific Coast lists a total of 1,021 electrical, gas, railway and kindred companies, including a comprehensive record of companies controlled by and absorbed, operating in the states of Arizona, California, Nevada, Oregon and Washington, together with complete information concerning the organization and engineering details of all companies constituting these industries. Of this total, 686 companies are devoted to the generation, transmission, distribution or utilization of electric light and power; 145 are gas companies, and 190 are electric-railway companies.

The directory is arranged so that the names of companies, firms and individuals engaged in the electrical and gas industries are given, not only by cities and towns under their respective states, but also under the industry or industries which they represent. There is given a full list of the officers and a detailed description of the power plant or plants, transmission lines, character of service, etc.

ELECTRICAL NEWS FROM FAR AND NEAR

CONTINENTAL EUROPE

Paris, October 15.—In the course of a trip through Switzerland I had occasion to take the trip over the electric railroad which passes through the region of Mont Blanc from Fayet to Chamonix and thence to the region near the Simplon. This line was built in order to open up a better means of communication through the present route, which is so much frequented by tourists. By the electric railroad the trip is agreeable and comparatively inexpensive. Passengers now take the Paris-Lyons-Mediterranean railroad line, which runs from Ceneva as far as Fayet, and at this point the electric railroad commences, running to Chamonix, and from thence to Vallorcine, which is the terminal point. Here commences the newly installed Swiss electric railroad, which runs through the valley of the Arve as far as Martigny. As this latter point lies on the Federal Railroad, it is possible to reach the Simplon Tunnel within less than two hours.

Thus it will be seen that the facilities for reaching this well-known region are being greatly increased. Another new enterprise is a rack-rail road which passes from Chamonix up the side of the mountain and reaches the glacier of the Mer de Glace, one of the principal points of interest in the region, aside from the views of Mont Blanc which are obtained from the different heights. The Paris-Lyons-Mediterranean Railroad Company controls the above-mentioned electric line, and, owing to the recent extension of the line past Chamonix in order to meet the Swiss electric line, it erected a turbine plant of considerable size at Chavants, in addition to the former one, which is located at Servoz. A new sub-station was also erected at the new section of the electric line. At present the trains are made up of a motor car and two trailers. From the terminus of the steam railroad it is now possible to arrive at Chamonix in a little over one hour. The combined trip over the French and the Swiss electric roads through the valley of the Arve takes 2½ hours, whence the Simplon Tunnel can be reached in two hours.

A French electrical enterprise of considerable scope is the proposed electric plant which is to be erected in the Ardeche region, near Lyons. The present project calls for a 10,000-horsepower steam plant in connection with a turbine plant lying on the Ardeche River. This latter station will also give 10,000 horsepower, using a dam of 60 feet in height. The hydraulic work to be carried out upon the river will have the effect of lessening the inundations and will also be a benefit to navigation upon the stream. Current will be distributed in the region, which is well populated, by means of a high-voltage power line. A number of municipalities have already adhered to the project.

The German state railroad department, whose headquarters are located at Berlin, is considering the question of using electric traction to a considerable extent upon the government lines, commencing with a number of sections of road and increasing these in the future. The present plans call for electric-line construction and rolling stock to the extent of $45,000,000.

In the Emmenthal Valley, which lies in the region of Berne, there is a project on foot for erecting a hydraulic station of considerable power. The stream of the Emme is expected to furnish at least 6,000 horsepower in the present stage of the enterprise. A dam is to be built upon the stream near Eggiwil for this purpose. The necessary funds for erecting the plant are nearly all raised at the present time, and the local assembly has appointed a commission to draw up the plans for the station.

Among the preparations which are being made at Brussels for the coming exposition of 1910 is the erection of a new sub-station for the electric lighting of the exposition. Among other electric enterprises in Belgium I note the new electric railroad which is being constructed at the well-known watering place of Spa. Work has already been begun upon this line.

Storage-battery cars are now coming into extensive use upon the standard-gauge railroads in Germany, and the Prussian state railroad department is using quite a number of them at present. The department recently ordered 19 accumulator cars from the Felten-Guilleaume-Lahmeyer Electric Company, and these have been recently delivered. The accumulator cars will draw trains made up of trailers, and are to be put in service on a number of sections of the railroad. A. de C.

NEW YORK

New York City, October 24.—The New York, New Haven & Hartford has found it advisable to change the hanging of the contact wire on most of the electrified portion of its line, having found that the wire as originally hung, was too rigid. To remedy this defect another wire has been strung an inch or two below the old contact wire, being hung from it at points half way between the triangles. The sliding bow or trolley touches this wire, and the blows at its points of support are cushioned in transmission to the rest of the structure, instead of striking directly the stiff triangles. This has proved so successful that the overhead construction has now been modified in this way over most of the tracks between Wakefield Junction and Stamford.

The second series of tests of car fenders and wheel guards for the New York Public Service Commission is now being held at the works of the Westinghouse company. The tests are similar to those held at Schenectady a month ago. Members of the Public Service Commission's staff who will be present during the two weeks the tests are to be continued are: William R. Willcox, chairman of the Commission; A. M. McLimont, electrical engineer; R. H. Noxen, assistant electrical engineer; George F. Daggett, Chief of the Bureau of Accidents; James Blaine Walker, second assistant secretary; Robert S. Wright, secretary to the Test Committee; Avery M. Schermerhorn, inspector of the Accident Bureau, and W. R. Thompson, assistant to the electrical engineer.

Final arguments have been made before the Public Service Commission on the proposal to establish joint rates and through routes between the north and south Metropolitan lines and the Fifty-ninth Street crosstown line, or, in other words, of re-establishing the transfer system. In the course of his argument John G. Milburn for the receivers of the Metropolitan, declared that the return of the transfer system would eventually result in the ruination of the roads and great suffering to the public. The commission has taken no action nor announced any date for such action. It will, however, take the matter up very thoroughly, and it is probable that an order will be issued some day next week.

The old horse-car line between City Island and Pelham Park is to be done away with and a mono-rail system substituted by the Monoroad Construction Company, which has completed the purchase from the Interborough Rapid Transit Company of the Pelham Park and City Island Railway Company. The mono-rail car which the company proposes to use is 50 feet long, 6½ feet wide and pointed at each end, running on four wheels placed under the car, but in tandem, two at each end, each wheel having double flanges and being driven by two separate motors, eight in all. These wheels run on a single rail spiked to ties in the ordinary manner, the ties being made of concrete. Above the car at each end is a flexible arm, connected with an X-shaped overhead truck, each truck consisting of four guide wheels which run on L-shaped overhead conductor rails.

For more than three hours one morning this week inbound trains in the electrified zone from Stamford, Conn., to Woodlawn, on the New York, New Haven and Hartford system, were blocked, and thousands of commuters were compelled to wait in their cars until steam engines were procured. Trains going from New York city toward New Haven kept running. W.

ILLINOIS

Peoria, October 24.—A new time-card for the southern part of the Illinois Traction Company's lines has been issued, and the through cars between Springfield and East St. Louis have been reduced in number for the winter, while the local cars have been increased. A new time-card for the division between Springfield and Danville is being prepared, but will not go into effect for some time.

The Illinois Traction Company has raised the wages of the street-car employes in Bloomington without any solicitation upon the part of the men.

The scale is based upon the length of time the men have been employed, and is a raise of one, two and three cents an hour.

At a meeting of the men backing the project of the building of an interurban between Springfield and Jacksonville it was stated that the matter of financing the line has been accomplished and that the line will soon be incorporated. Work is expected to be commenced this fall, if possible, and later the line will be extended to Quincy.

A suit growing out of the telephone situation in Tazewell County has been commenced under the title of Tazewell County Telephone Company et al. vs. Union Independent Telephone Company et al. A temporary injunction was granted, and the case is set for hearing at the December term of the Circuit Court. The plaintiffs allege that they were the owners of the Tazewell County Telephone Company previous to the 3d of March, with offices at Morton. Early in the year officers of the Union Telephone Company, which had been organized under the state laws of Maine, secured an option upon the Tazewell County company's property. A tangle resulted, and the present suit is the outcome.

A freight car was switched near the lighting plant in this city on Friday night and jumped the track, running into a pole belonging to the company, carrying a large number of wires, with such force as to break the pole and cause it to fall, making a short-circuit in nearly all the circuits, with the result of stopping all the lights in the city and making a bad mess in the power house until the cause of the trouble could be discovered.

An ordinance has been introduced in the Council at Springfield requiring all the electric wires to be placed underground in the fire limits. The ordinance includes all the wires except the overhead trolley wire of the street-railway company. The limit, as set forth in the ordinance, is January 1, 1910. Penalties are provided for the violation of the ordinance. V. N.

INDIANA

Indianapolis, October 24.—A new electric railroad, to be known as the Valparaiso, Hobart and Gary Line, will be built by James Hopkins, George Earl and Francis Yeaker, capitalists, who own a large territory near the city of Gary. The promoters are now asking for franchises, and work will begin as soon as these are obtained. The ultimate purpose of the company is to construct a line from Gary to Chicago.

According to report, the Murdock syndicate has leased the Air Line Road for the purpose of operating cars from Laporte to Chicago. The Murdock syndicate owns a network of interurban lines in Northern Indiana, reaching as far south as Wabash, through Goshen, Elkhart, Mishawaka and South Bend to Laporte. Since completing its line from South Bend to Laporte, the company realizes the necessity of getting into Chicago, and the leasing of the Air Line over which to operate cars will constitute 18 miles of the necessary road to reach Chicago. When these arrangements are completed, it will be possible to operate electric cars from Chicago to Louisville by way of Indianapolis.

The Indiana and Michigan Electric Company of South Bend has shut down its local generating plant, operated by steam, and will keep it merely in reserve in case of temporary disablement of the several waterpower plants owned by the company, at Berrien Springs, Buchanan, Niles and Hen Island now in successful operation, and capable of generating almost any amount of electricity that may be required.

The Federal government has taken steps toward the repair of the Grand Rapids lock and dam in the Wabash River near Hazleton. It is the intention to expend $50,000 in restoring the structure by replacing the wooden portion with concrete work. It is understood that the power will be leased for the purpose of generating electricity.

At a recent meeting of the directors of the Evansville and Southern Indiana Railway Company, at Evansville, attended by James Murdock, Charles M. Murdock, Henry W. Marshall and H. B. Smith, it was decided to push the construction of the Evansville and Southern Indiana electric railway from Patoka to Terre Haute, at which place it will connect with the Terre Haute, Indianapolis and Eastern Traction line, over which arrangements will be made to operate cars into Indianapolis.

The Board of Public Works of Evansville has forbidden the interurban traction line from stringing telephone wires upon its poles, and has ordered those already strung to be removed because of the city's policy to cause all wires to be put underground. The traction lines say that their franchises provide for the stringing of all necessary wires overhead. The courts will probably have to determine whether the city can abrogate the provision in the franchise relied upon by the companies.

Judge Dodge has made a ruling in the injunction case wherein it is sought to restrain the mayor and City Council of Goshen, in carrying out a contract with R. N. Ashe to install a new electric-light plant in Goshen. The effect of the ruling is that the contract entered into by the city with Mr. Ashe will have to be ratified by a vote of the people.

Complaint has been made by the citizens of Columbus, Ind., that promises made by the Central Indiana Lighting Company, which took over the Columbus Street Railway and Light Company a year ago, have not been kept. The company agreed to spend $200,000 in improvements, which would include all-day and all-night electric-light service, extension of the light service, a new power plant, steam heat from a central plant, new street cars and an extension of the car line. S. S.

NORTHWESTERN STATES

Minneapolis, October 24.—Green electric street lights have been installed in Menasha, Wis., and will also be installed in Neenah.

Cedar Rapids, Iowa, men propose to construct a dam across the Cedar River to furnish 5,000 horsepower for generating electricity.

H. W. Irwin, manager, is planning improvements at the local electric-light plant at Eveleth, Minn., that will make it one of the model plants of that region.

It is expected that 24-hour electric service will be given in New Prague, Minn., about December 1st.

A. C. Burmeister was granted a 15-year franchise for electric light, heat and power at Redwood Falls, Minn. New machinery and a 65-horsepower engine will be installed.

It is expected that the new power plant being erected by the Madison River Power Co. at Parrot, Mont., will soon be completed and ready for operation.

It is expected that the Mitchell Power Co. of Mitchell, S. D., will have the machinery installed and the plant in running order by December 1st.

Owing to low water in the Pelican and Wisconsin rivers Rhinelander, Wis., is without electric light for the first time in 20 years.

The Douglas County Telephone Company, of Superior, Wis., has filed a new schedule of rates with the state railroad commission, making its charges the same as those of the People's Telephone Company. The rate for business connections is $36 per annum and for two-party lines $30, and four-party lines $24. Residence service ranges from $16 to $25.

The Stanley Telephone Company of Stanley, N. D., has contracted with the Vote-Berger Company of La Crosse, Wis., for a new telephone system.

The council of St. Paul has passed the ordinance regulating telephone rates and limiting the charge for business service for single lines to $4 a month within a radius of two miles from the old postoffice. This applies to the Northwestern Telephone Exchange Company only, as the Tri-State Telephone and Telegraph Company's rates are on that basis already. The Northwestern immediately secured an injunction to prevent the publication of the ordinance, which would have become effective upon publication. The action was brought in the Federal court, and the company sets up that the action is unreasonable, and that to comply would cost the company $60,000 a year. The case will be argued on November 9th.

Mr. Driftmire having resigned his position as manager of the Mutual telephone office at Shenandoah, Iowa, has been succeeded by M. I. Robinson of Madison, Wis.

The New State Telephone Company of Sioux City, Iowa, has acquired the Citizens' Telephone Company of Sioux Falls, S. D., for a consideration of $94,700, thus making it the largest Independent company in the Northwest, with the exception of the Tri-State company of Minneapolis.

The Northeastern Iowa Telephone Association held its annual convention at Waterloo, Iowa, recently, H. A. Douglass of Cedar Rapids, president of the association, presided.

The E. A. Hurmance Telephone Company has completed a metallic line from West Union, Iowa, to Elgin and Clermont, Iowa, and contemplates building an additional metallic line to Oelwein and Waverly. R.

PACIFIC SLOPE

San Francisco, October 21.—Mr. Marsden Manson, city engineer of San Francisco, has filed a number of waterpower claims in Tuolumne County, California, in the vicinity of the Hetch Hetchy Valley, from which the municipality of San Francisco plans to draw its water supply. These water rights aggregate a total of 30,000 miners' inches, and are intended to be used in developing hydro-electric power for the construction of the waterworks system and for other purposes.

Several other smaller water rights have been filed during the week appropriating waterpower at various points in the Sierra Nevada Mountains. These include filings by S. H. Robinson on waters in Tuolumne County, by F. A. Mitchler in Tuolumne County, by A. R Sprague in Eldorado County and by George Thornton in Siskiyou County.

The Bay Counties Power Company, one of the larger of the sub-companies of the California Gas and Electric Corporation, is doing considerable betterment work in the vicinity of its plant in Nevada County. A new siphon pipe is being put in at Myer's Ravine and the flume on Rock Creek is being replaced by a pipe line.

The Mojave Water and Power Company has been incorporated in San Francisco with a capital stock of $2,000,000 by Julian Matthieu, H. C. Mack, F. C. Van Deinse, C. F. Metteer and C. S. Goodrich.

W. W. Briggs, district office manager for the Westinghouse Electric and Manufacturing Company, has returned to San Francisco from an eastern trip.

The city trustees of Healdsburg, Cal., have employed an engineer to make plans and specifications for doubling the power of the municipal power and lighting plant. The improvement contemplates a pipe line 2,800 feet long.

The Board of Trustees of Lemoore, Cal., has called an election to vote on an issue of $25,000 in bonds for the construction of a municipal light and water plant.

During the last week franchises for electric street railways have been granted to W. T. Wheatly for 20 years in Wilmington, Cal., and to N. J. Nolan in Los Angeles, Cal. The San Joaquin Valley Railway Company has applied for franchises in Modesto and Stockton, Cal., having completed its survey for a line between these two places.

J. E. Webb, president, and A. G. Mollin, treasurer, of the Golconda Telephone and Power Company of Golconda, Nev., have been granted a franchise for an electric transmission line in Humboldt County, Nev.

The Utah Light and Railway Company has awarded to the J. P. O'Neil Construction Company of Ogden, Utah, an $80,000 contract in connection with the new power plant the company is erecting in Weber Canyon, near Ogden. The contract includes a half mile of seven-foot concrete-pipe line, a 1,000-foot retaining wall and a dam across the river at the site of the proposed power plant.

The Knight Smelting Company of Tintic, Utah, has secured water rights and will put in a small power plant to develop 100 horsepower.

President B. S. Josselyn of the Portland Railway, Light and Power Company of Portland, Ore., has returned from the East after a conference with eastern stockholders. A number of betterments have been authorized, including the raising of the voltage of the Cazadero transmission line from 10,000 to 30,000, the installation of an additional unit of 5,500 horsepower at the Cazadero power plant, increasing the capacity of that plant to 20,000, extensive improvements at sub-station A, in Portland, the building of consolidated shops for the company's narrow and broad-gauge railway lines, and the laying of underground conduits for its power transmission and distribution system throughout the business district of Portland. The contract for the latter item has been let to W. S. Barstoe & Co. of Portland, for $750,000. It is estimated that the improvements authorized will aggregate in cost about $2,000,000.

The City Council of Newport, Ore., has accepted the offer of Hall Bros. for the building of an electric-light and water plant and has authorized a franchise to be drawn up accordingly.

F. A. Anderson has filed notice of the appropriation of 88,000 inches of water from the McKenzie River near Eugene, Ore., for the New England Water Power Company. The water will be used for developing electricity.

Walter Mackay of Portland, Ore., has secured water rights on the Santiam River and Lake Marion, near Albany, Ore., preliminary to the development of electric power at a point near Lake Marion.

The Washington Water Power Company of Spokane, Wash., announces the awarding of contracts for four sets of waterwheels, each weighing 650,000 pounds, and each having a capacity of 9,000 horsepower operated under a head of 68 feet. The wheels will be installed on the Spokane River, 15 miles from the city of Spokane, for the purpose of developing electricity for Spokane and vicinity.

The Edmonds Electric Light and Power Company has purchased a site at Edmonds, Wash., and is arranging for the erection of a 200-horsepower steam plant capable of operating 1,500 lights. The estimated cost of the plant is $10,000.

Ball & McNarney of Seattle, Wash., have secured the contract for installing a new electric-light and water plant at Cashmere, Wash., on their bid of $6,112.

Chester Pennoyer, formerly Coast manager for the National Conduit and Cable Company, is now general superintendent for the Great Western Power Company. A.

The Underwriters' Laboratories, Chicago, have leased for 96 years a plot of ground 166⅔ by 100 feet in Ohio Street near St. Clair and adjoining the present laboratories. The annual rental is $1,796, and the Laboratories promise to erect within five years an addition to the present building, to cost not less than $25,000.

PERSONAL

Mr. F. H. Knox, formerly secretary of the Spartanburg Railway, Gas and Electric Company, Spartanburg, S. C., has been elected vice-president and general manager of the company.

Mr. George F. Morse, master mechanic of the Terre Haute, Indianapolis and Eastern Traction Company at Terre Haute, Ind., has been appointed master mechanic of the Pensacola Electric Company of Pensacola, Fla.

Mr. Charles G. Lohman of South Bend, who has been general superintendent of the Chicago, South Bend and Northern Indiana traction line, known as the Murdock system, has been promoted to be general traffic manager and placed in charge of all traffic on the entire system.

General Manager A. A. Anderson of the Indianapolis and Louisville Traction Company will resign that position on November 1st and give his entire attention, as general manager, to the Indianapolis, Columbus and Southern Traction Company, with chief offices in Columbus. Mr. Anderson is now located at Seymour, Ind.

Mr. J. W. Spillman, chief train dispatcher on the northwestern division of the Terre Haute, Indianapolis and Eastern electric-railway line, has been appointed general superintendent of that division to succeed Mr. Ray W. Reynolds, who recently resigned to become general superintendent of the Chicago, South Bend and Northern Indiana Railroad Company.

Ossian Guthrie, the "father of Chicago's drainage system" and one of the best known engineers and geologists of the Middle West, is dead at the age of 82 years. When a youth of 20 Mr. Guthrie built the steam engine which propelled the first tug up the Chicago River, and had several inventions to his credit, besides his active participation in several great public and railroad works.

Mr. Orville Wright, the aeroplanist who narrowly escaped death in the accident to his aeroplane during a flight at Fort Myer, Va., five weeks ago, will soon be able to leave Washington for his home at Dayton, Ohio. His most serious injury was a broken thigh. The splint has been removed and an X-ray examination of the fracture shows that the knitting of the broken bones has been perfect.

Mr. C. A. Alderman has been appointed chief engineer of the Buffalo and Lake Erie Traction Company, Buffalo, N. Y., to succeed Mr. E. M. De Bruin, resigned, who has become connected with the L. E. Myers Company, Chicago. Mr. Alderman has recently been connected with J. G. White & Co., Inc., New York, whose employment he entered after resigning as chief engineer of the Cincinnati Northern Traction Company. Mr. Alderman has had an extended electric-railway experience.

Mr. L. B. Marks, consulting engineer, formerly at 220 Broadway, New York, and Mr. J. E. Woodwell, recently engineer in the United States government service, Washington, D. C., announce that they have opened offices in the Terminal Building, Forty-first Street and Park Avenue, New York city. This association has been formed for the purpose of enlarging the scope of their individual work by covering not only illuminating engineering, but all related work incident to the generation, distribution and application of electric current for light, heat and power.

Mr. William E. Keily has resigned as managing editor of the Western Electrician—a position he has held since the retirement of the late John B. O'Hara in 1899. This action grows quite naturally out of the change of ownership, announced by a publisher's note on another page, and Mr. Keily has only the friendliest feeling toward his capable and accomplished successor, Mr. A. A. Gray of the Electrical Review. He hopes, however, that he may be permitted this note of farewell to the readers of the Western Electrician, with many of whom he is on terms of personal friendship, and in all of whom he takes a cordial interest, which he trusts is in some measure reciprocated. Mr. Keily, who was engaged in daily journalism before specializing in the electrical field, expects, according to the present plan, to engage in general and technical literary work at his home on Minerva Avenue, Chicago, after November 1st. He has tried to serve the readers of this journal to the best of his ability, and his good wishes follow every one of them in their several walks in life.

ELECTRIC LIGHTING

Talmage, Neb., contemplates voting bonds for an electric-light plant.

The Gibbon (Neb.) Electric Light Company has been incorporated with a capital of $10,000.

Humboldt, Tenn., will install an additional 250-horsepower engine and dynamo to generate current for 3,000 lights at the municipal power house.

The McCook (Neb.) Electric Company has been incorporated with a capital stock of $100,000.

Pearson & Jackson of Sparta, Tenn., contemplate developing the waterpower of the Great Falls of Falling Water River and building a plant to transmit electricity for manufacturing and lighting.

W. N. Camp of Ocala, Fla., contemplates the development of the Withlacoochee River in Florida to furnish electricity for light and power. Locks and dams are to be constructed.

The tri-cities of Keokuk, Warsaw and Hamilton, Iowa, were in darkness and the electric street-car system of Keokuk, and the Keokuk and Warsaw interurban were tied up by the bursting of the 25-foot flywheel in the power house of the Light and Power Company, near the Keokuk canal.

Chief J. F. McLaughlin, of the Philadelphia Electrical Bureau, who had charge of the decorations and illumination of the City Hall and other features in connection with the recent Founders Week celebration, has submitted to Mayor Reyburn a statement of the expenses incurred. A total of $49,000 was expended in illuminating the City Hall. However, included in these expenditures are a number of improvements that are permanent, including the 28 memorial electroliers. The installation further comprised four electric flags which were placed on the turrets of the building, and wiring for more than 160,000 electric lights.

ELECTRIC RAILWAYS

Sherman, Tex., has issued $16,000 in bonds for an electric-light plant.

Deer River, Minn., has granted W. A. Overton a 20-year electric-light franchise.

Temple, Tex., is to vote on a bond issue for the construction of an electric-light plant.

W. R. West & Son have been granted a franchise for an electric railway in Manhattan, Kan.

Clinton, Iowa, will vote November 3d on giving a 25-year franchise to the Clinton Street Railway Company.

POWER TRANSMISSION

A company has been organized in Georgia with a capital of $3,000,000 for the purpose of developing Suwannee Falls. It is the purpose of the company to put in interurban electric railroads connecting a number of cities and towns in Florida and South Georgia.

The United Powers Company, incorporated with $100,000 capital stock, will establish an electric power plant near Abingdon, Va., installing low-head turbines with a capacity of 1,000 horsepower. Henry J. Palmer, president and engineer, is at 102 Silsby Building, Newport News, Va.

An electric-light and power plant, taking power from the dam across Boardman River, is being constructed to supply about 1,200 horsepower and also furnish lights to Traverse City, Mich. Next spring a larger dam is to be put in without disturbing the temporary power. The new dam, when completed, will have a head of 43 feet and generate 2,400 horsepower.

The Northern Colorado Power Company plans an extension of the transmission line from Fort Collins to Wellington, to provide for lighting the latter place and to furnish power for irrigating plants contiguous to the line. Superintendent Mooney reports that close estimates indicate 3,000 acres of farming land will be under pump irrigation in Northern Colorado next year. The extension of the transmission line of the Central Colorado Power Company from Salina to Sugar Loaf, is being built to supply power to the United States Gold Corporation for operation of its mine and the 150-ton cyanide mill now under construction. This line is a part of a network that will extend throughout all the mining districts of the county to furnish power for the operation of the mines and mills and lighting of the camps.

TELEPHONE

The Aitkin (Minn.) Telephone Company has been granted a franchise.

The Farmers' Telephone Company of Essex, Iowa, has been incorporated with a capital of $15,000.

The Lead Belt Telephone Company of Flat River, Mo., has been incorporated with a capital stock of $20,000.

At Closter, Neb., the Shell Creek Mutual Telephone Company has been incorporated with a capital stock of $20,000.

The Golden Rod Telephone and Telegraph Company has been incorporated at Wahoo, Neb., with a capital stock of $100,000.

PUBLICATIONS

The Standard Roller Bearing Company of Philadelphia is sending out to its student friends and others interested the 150-page official guide to the University of Pennsylvania. This book has been edited by Prof. George E. Nitzsche and contains over 40 illustrations of the various buildings and views on the campus of this old and well-known university.

Bulletin No. 1000 of the Stromberg-Carlson Telephone Manufacturing Company on the subject of mine telephones, is the first of a new series of bulletins issued by this company. This bulletin is complete in its details and will be supplied to any-one interested on application to the company's office at Rochester, N. Y. The value of telephone service in mines is discussed and special instruments, line material and circuits are given in the bulletin.

During the coming year there will be published Volume I. of the Armour Engineer, the semi-annual technical publication of the student body of Armour Institute of Technology, Chicago. This is an engineering magazine, issuing two large numbers each year, one each semester. It contains technical articles by prominent Armour graduates, important papers presented to the engineering societies, results of research in the Armour testing laboratories, editorials, book reviews, engineering notes and comments.

Pamphlet D20, recently published by Elliott Brothers of London, England, describes the Elliott electrical recording instruments, comprising ammeters, voltmeters and wattmeters. These instruments are made for direct-current and single and poly-phase circuits in both the portable and switchboard types. The paper for the record comes in lengths of 65 feet, lasting for one month at the rate of one inch per hour. John Bliss & Co., 128 Front Street, New York, are the American agents for these instruments.

A number of publications have been prepared recently by the Central Electric Company of Chicago. A circular describes a line of flexible steel conduit and tools used in its installation. Another is devoted to Galvaduct interior conduit. Other circulars deal with Okonite automobile and motor-boat wires, portable vest-pocket voltmeters and ammeters for battery testing, direct-current and alternating-current vibratory massage motors, Samson strand or messenger-wire grip, and adjustable brackets for desk telephones.

Spon & Chamberlain, 123 Liberty Street, New York, have put on the market a useful chart, known as the Herrick Planigraph, for quickly solving problems in copper conductors in electric circuits, which comprise the following four quantities: Amount of current, distance to be carried, volts drop and size of wire required. With any three of these quantities known the fourth can be found at once. Four sets of scales are provided, one each for branches, feeders and mains, railway transmission and long-distance transmission.

The Western Electric Company of Chicago has published Bulletin 5910-8 on the electrical equipment of mines. This 24-page illustrated pamphlet deals largely with magnetic ore separators which are suitable for some 16 different mineral separations. In the line of power equipment there are described standard alternating-current and direct-current generators and motors and a special line of hoist motors. The bulletin concludes with descriptions of motor-driven exhaust fans and inter-communicating telephone systems.

The Massachusetts Chemical Company has recently placed on the market two of its products that are of particular interest to the electrical trade. Walpole insulating board, as its name implies, is a solid insulating material manufactured in sheets of various thicknesses ready for use for all appropriate insulating purposes for which hitherto ordinary fiber board or other similar material has been employed. It can be readily machined and possesses a valuable feature in its inherent resistance to moisture, acids and alkalies, and oil. Another product of the company is the field-coil cushion. This resilient device is designed to slip on over the field poles of railway motors between the coil and the frame to prevent injury to the coil, due to its movement on the core under the combined influence of the varying magnetization of the core and the vibration of the motor. Extended tests of both these products are said to have shown no deterioration even under the most trying conditions.

SOCIETIES AND SCHOOLS

The charter, by-laws and membership list of the Engineers' Society of Western Pennsylvania has just been issued in pamphlet form corrected to September, 1908, from the society headquarters, 803 Fulton Building, Pittsburg, Pa.

The Electrical Contractors' Association of Texas met at Dallas October 27th and 28th. Addresses were given by R. B. Stricter, G. Loring of Cleveland, Ohio; L. F. Filo of Houston, Martin Wright of San Antonio and T. N. Monogan of Dallas.

On October 23d the New England Section of the Illuminating Engineering Society held its first meeting of the season in the Edison Building, Boston. The papers presented at the recent convention of the society in Philadelphia were abstracted by members who had attended the convention, and then discussed by the section.

The Electric Club of Chicago has announced the following program for its weekly meetings during the coming month: November 4th, business meeting; November 11th, address by William Carroll, city electrician of Chicago, on "Street Lighting—Past, Present and Future;" November 18th, speech by Thomas I. Stacey of the Electric Appliance Company, on "Chicago, the Great Central Market;" November 25th, Frederic P. Vose, attorney for the Electrical Trades Association, will talk on "Contracts." At the meeting of October 21st A. D. Curtis of the National X-ray Reflector Company spoke on "The Problem of Indirect Illumination." On October 28th Miles Lambert of the Westinghouse Electric and Manufacturing Company talked on the comparative advantages of direct-current and single-phase current for traction purposes.

MISCELLANEOUS

The report that Germany intends to place a tax on electricity for light and power is substantially confirmed as the result of the premature disclosure of the contents of Herr Sydow's finance-reform bill. The result has been to evoke a storm of protest from the business and manufacturing elements throughout Germany.

Dayton, Ohio, is considering a city ordinance requiring plumbers to use electric hand-lamps when working in enclosed basements or cellarways. Several destructive explosions occurred recently as the result of lighted torches.

Benson Bidwell, 72 years old, and his son, Charles E. Bidwell, were sentenced to the penitentiary for from one to 10 years for defrauding stockholders in the Bidwell Electric Company of Chicago, a concern which was engaged in the manufacture of the "cold motor," pretended to be a highly efficient electrical machine which by means of a self-contained refrigerating device was supposed to grow colder as the load was increased. The Bidwells were convicted on March 17 of operating a confidence game, but the sentence was delayed from time to time to enable them to secure funds to carry the case to a higher court.

TRADE NEWS

Muralt & Co. of New York have secured the contract for the enlargement and improvement of the hydro-electric plant of the Riverhead Electric Company, of Riverhead, L. I. The old waterwheels now in use will be taken out and new Trump turbines of the vertical-shaft type will be installed. The electrical equipment will generate three-phase, 25-cycle, 1,100-volt alternating current. There is also an auxiliary steam plant for emergency purposes.

Electric conduits and wiring will be needed in the new postoffice building at Newton, Kan., and Carlisle, Pa. Bids for the construction of the complete buildings will be opened on December 1st and 2d, respectively, at the office of the supervising architect of the Treasury Department, Washington, D. C. Copies of the specifications may be had at that office or from the custodians of the respective sites.

A convenient time and labor-saving instrument is being made by the Edge Computer Sales Agency, 220 Broadway, New York. It is the Edge weight computer for structural shapes and is serviceable for structural engineers in readily determining the weights of any size of plates or angles and the weight of any length of beams of any structural shape whose weight per foot is known. The instrument consists of two disks, one rotating in the other, each disk being marked with logarithmic scales representing the dimensions in feet and inches of the various shapes and the result in pounds. The operation of computing any weight is extremely simple and rapid, and the result is correct to within one-third of one per cent

DATES AHEAD

Association of Car Lighting Engineers (first annual convention), Chicago, November 16th to 21st.

Chicago Electrical Show (fourth annual), Coliseum, January 11th to 23d, 1909.

ILLUSTRATED ELECTRICAL PATENT RECORD

Issued (United States Patent Office) October 20, 1908

901,322. Electrical Accumulator. Charles Busch, New York, N. Y. Application filed July 15, 1908.

The electrodes of this storage battery are provided with a perforated sectional casing, held together by elastic bands passing through the perforations of the casing and of the electrode.

901,331. Electric-railway Signal. Edward A. Everett, Detroit, Mich. Application filed June 27, 1906.

This signal comprises a signal circuit with a relay magnet and auxiliary mercury circuit-breaker.

901,332. Insulating Material. Willis E. Everette, Tacoma, Wash. Application filed May 17, 1906.

The material is formed of insoluble, tenacious, flexible threads and filaments, composed of bi-silicate of calcium and aluminum, and coated with a solution of muscovite.

901,336. Automatic Electric-lighting System. Carl J. Gardeen, Columbus Township, Anoka County, Minn. Application filed December 5, 1907.

An explosive-engine-driven isolated plant is equipped with a storage battery and automatic regulator therefor.

901,341. Alternating Electric-current Machinery. Alexander Heyland, Brussels, Belgium. Application filed May 2, 1903.

Means for compounding an alternating-current generator comprise current transformers whose secondaries supply the auxiliary field through a commutator and brushes.

901,349. Burglar Alarm. Patrick T. Keefe, New York, N. Y. Application filed January 18, 1908.

The device closes contacts inclosed in the door casing.

901,352. Water Purifier. Henry Korten, Chicago, Ill., assignor to Frederick Y. Nichols, Chicago, Ill. Application filed May 23, 1907.

By electrolytic separation the scale-forming impurities are caused to cohere in masses, which are received in a sediment chamber and filtered through a mercury filter.

901,354. Scenic Effect. De Witt H. Leas, Delaware, Ohio. Application filed January 8, 1908.

Mounted to slide on an inclined wire is a body of absorbent and inflammable material which is electrically released and ignited, permitting it to slide, burning, down the wire.

901,368. Apparatus for Magnetic Separation. Clarence Q. Payne, Stamford, Conn., assignor to the International Separator Company. Application filed October 3, 1903.

A transversely laminated separating cylinder is provided with a number of magnetizable circular disks having edge projections, placed alternately and contacting with a number of non-magnetizable disks, in combination with two opposing pole-pieces, between which a magnetic field is formed, and between which the cylinder is arranged to revolve.

901,372. Telegraphy. Louis M. Potts, Baltimore, Md., assignor to the Rowland Telegraphic Company, Baltimore, Md. Application filed March 9, 1907. Renewed April 10, 1908.

The method of balancing a number of electric circuits consists in connecting a number of indicating instruments of the electro-dynamic type between the circuits, dephasing the currents flowing in the movable elements of the instruments, and adjusting the constants of the circuits until a balance is indicated.

901,377 to 901,383. Electric-railway System. William Robinson, Brooklyn, N. Y. Applications filed October 27, 1902, to August 13, 1907.

In an electric-railway system embodying a sectional working or contact conductor, the source of working-current supply is normally disconnected from the working sections. Means actuated by a car or train, on entering a section or block, connects the current supply to the section. In case a second train enters the block automatic means are operated for causing the train to close its own motor circuit upon itself.

901,397. Apparatus for Recording and Reproducing by the Telegraphone Principle. Harve R. Stuart, Wheeling, W. Va. Application filed March 2, 1908.

The method of reproducing the record comprises two magnetic circuits, independent of the record, for alternately augmenting the magnetic circuits of the record, and a vibratory diaphragm influenced alternately by the two magnetic circuits.

901,422. Connector for Electrical Conductors. Frank B. Cook, Chicago, Ill. Application filed April 2, 1908.

A one-piece sleeve is adapted to receive the ends of the strands to be connected, the exterior surface of the sleeve being tapered from the center toward each end and threaded. The sleeve is split longitudinally along one side, and carries a nut for each end adapted to be tightened up, whereby the sleeve tightly grips the strands.

901,423. Switch for Charging and Discharging Storage Batteries. James H. Cormick, Belleville, N. J., assignor to the Union Switch and Signal Company, Swissvale, Pa. Application filed February 29, 1908.

A series of clips of different heights are interposed between the two pairs of charging clips and with which the knives contact when they are disengaged from the charging clips, connecting the interposed clips.

901,424. Electrically Controlled Switch. Archibald S. Cubitt, Schenectady, N. Y., assignor to the General Electric Company. Application filed April 22, 1908.

A current-carrying holding coil contains a core movable in the field and arranged to be moved by an actuating coil and held by the holding coil. Means operable from a distance varies the limit of movement of the core in the field of the holding coil.

901,427. Vapor Electric Apparatus. Leonard E. Dempster, Schenectady, N. Y., assignor to the General Electric Company. Application filed October 31, 1904.

The conductors are protected by radiating sleeves, consisting of glass with a helix of wire embedded therein. (See cut on next page.)

901,428. Electric-resistance Conductor. John T. H. Dempster, Schenectady, N. Y., assignor to the General Electric Company. Application filed November 4, 1907.

The alloy contains nickel, iron, chromium, and a manganese content of approximately five per cent., the iron content not exceeding 50 per cent.

901,432. Arc-lamp Headlight. Richard Fleming, Lynn, Mass., assignor to the General Electric Company. Application filed June 16, 1905.

The carbons are placed horizontally with the positive crater facing the reflector, the carbons being provided with an automatic feed.

901,435. Amusement Device. Percy W. Fuller, Boston, Mass. Application filed July 8, 1907.

The car consists of a cylindrical body adapted to turn bodily about its axis and roll along the track. To propel the car up the grades of the track, the armature element of a motor encircles the car body and the field element is located along the track.

901,440. Dynamo-electric Machine. Arthur I. Hadley, Fort Wayne, Ind., assignor to the General Electric Company. Application filed May 14, 1906.

The field poles are composed of central bundles of laminæ placed between two other bundles of laminæ, the central bundle being wider than the other laminæ, so that each side of the central bundle projects by the other bundles.

901,441. Selective Signaling System. Orlando W. Hart, Fall River, Mass. Application filed August 10, 1907.

A sign characteristic of the station is made when the signal is set and locked.

901,445. Primary Battery. Karl Heintz, Munich, Germany. Application filed December 26, 1907.

The cell, which is of the Bunsen type, contains a sulphuric-acid solution of about 30 per cent. mixed with nitric acid, and an auxiliary concentrating solution of concentrated sulphuric and nitric acid. A separating carbon diaphragm is interposed between the mixture and the exciting solution.

901,448. Fuse-holder. Bryson D. Horton, Detroit, Mich., assignor to the Horton-Massnick Company, Detroit, Mich. Application filed August 29, 1904.

A spring is held in contact with the exterior of the casing while the fuse is unbroken.

901,477. Electric-railway System. William Robinson, Brooklyn, N. Y. Original application filed July 20, 1904. Divided and this application filed October 5, 1904.

The working conductor is formed in sections insulated or separated from one another.

901,479. Electric Protective Apparatus. Charles A. Rolfe, Adrian, Mich., assignor to the Rolfe Electric Company, Rochester, N. Y. Application filed April 20, 1903.

A spring is held in tension by a softenable material, comprising wax, rosin and a powdered conductor, and released when an unduly strong current softens the material, opening the electrical circuit.

901,497. Carbon Electrode. Joseph T. Szek, London, England. Application filed September 23, 1907.

The electrode is provided with longitudinal grooves throughout its length, communicating with a transverse groove at the base.

901,498. Condenser. Elihu Thompson, Swampscott, Mass., assignor to the General Electric Company. Application filed May 5, 1904.

Insulated conducting sheets are interspersed between the active charging sheets of the condenser.

901,499. Combined Motor and Compressor. Charles P. Tolman, New York, N. Y., assignor to the Roteng Manufacturing Company. Application filed November 16, 1905.

The compressor mechanism is contained within the motor casing. (See cut on next page.)

901,506. Vapor Electric Apparatus. Willis R. Whitney, Schenectady, N. Y., assignor to the General Electric Company. Application filed October 31, 1904.

A glass member containing mercury constitutes one electrode, and a metal tube sealed about the glass and having an exposed portion constitutes another electrode.

901,509. Switch for Charging and Discharging Storage Batteries. Asbury G. Wilson, Wilkinsburg, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Application filed February 28, 1908.

The switch is especially designed for use in connection with a signal system.

901,512. Rheostat. Paul H. Zimmer, Schenectady, N. Y., assignor to the General Electric Company. Application filed May 20, 1907.

The rheostat arm has two opposite directions of rotation, for starting and speed control, respectively.

901,513. Induction-motor Control. Ernst F. W. Alexanderson, Schenectady, N. Y., assignor to the General Electric Company. Application filed July 12, 1906.

The arrangement consists in having two motors of different pole-numbers, a third motor having the same number of poles as one of the first two motors, and means for connecting the third motor to the source in cascade with either of the other motors and in parallel with the other motor of the same pole-number.

901,514. System of Motor Control. Hans Alexander, Berlin, Germany, assignor to the General Electric Company. Application filed May 20, 1907.

A separately excited generator supplies a separately excited motor having main and auxiliary windings. Means for controlling the field strength of the generator varies the voltage supplied to the motor. A series exciter has a field winding connected in the main circuit, the auxiliary field winding of the motor being connected to the exciter and being provided with a reversing switch. (See cut.)

901,529. Arc Lamp. Richard Fleming and Cromwell A. B. Halvorson, Jr., Lynn, Mass., assignors to the General Electric Company. Application filed May 16, 1904.

The electrodes are brought together to strike an arc, and thereafter one electrode is rapidly rocked.

901,540. Combined Electric Alarm and Light. William A. Lindsey, Narberth, Pa. Application filed July 18, 1907.

Through a double-contact relay the alarm circuit rings a bell and turns on a light.

901,570. Telephonic Transmitter. Frederick Q. Warrell, Lansdowne, Pa., assignor to the Euelectric Company. Application filed October 3, 1907.

The entire transmitter diaphragm is backed with granular carbon.

901,611. Apparatus for the Extraction of Metals from Their Ores. William E. Greenawalt, Denver, Colo. Application filed February 1, 1904. Renewed March 30, 1908.

Electrolytically generated chlorine is dissolved and the solution applied to the ore to be treated.

901,613. Electromechanical Regulator for Electric Tension. Joseph M. C. Herrgott, Valdoic, France. Application filed April 27, 1906.

A slide rod connected to a solenoid armature carries multiple admission valves.

901,614. Circuit-breaker. Edward M. Hewlett and Theodore E. Button, Schenectady, N. Y., assignors to the General Electric Company. Application filed October 22, 1904.

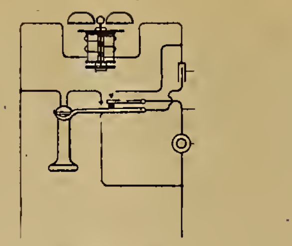
A screw for adjusting the armature has a bead for indicating directly upon the scale the adjustment.

901,627. Insulator. Royal T. Langlan, Boston, Mass. Application filed December 10, 1907.

The insulator comprises two separable sections having bosses with abutting faces, one of the sections constituting a spacer and the other being formed to inclose the lower end of a bolt.

901,630. Operating Means for Circuit-controlling Devices. Julius K. Lux, Washington, D. C. Application filed July 31, 1906.

The indicator for an enclosed electric switch has a slip-drive abutting connection with the switch for positioning the indicator relatively to the switch and allowing the indicator to rotate independently of the switch when power in excess of a predetermined amount is applied.



No. 901,738.—SUBSCRIBER'S CIRCUIT

901,649. Space Telegraphy. Oscar C. Roos, Newton, Mass., assignor to the Stone Telegraph and Telephone Company, Boston, Mass. Application filed June 10, 1907.

The resonant receiving circuit has a very high impedance for oscillations of the frequency generated by the oscillation-producing circuit, while the system comprising the elevated conductor and parallel-branch circuit has a very low impedance for oscillations of the frequency to which the resonant receiving circuit is attuned.

901,666. Disk for Influence or Static Induction and Condenser Machines. Alfred Wehrsen, Berlin, Germany. Application filed March 10, 1908.

Corrugated metal sectors are imbedded in the insulating material of the disk.

901,668. Safety Apparatus for Railways. Samuel L. Adelson, New York, N. Y., assignor of one-half to Maurice Adelson, New York, N. Y. Application filed March 18, 1908.

Pivot arms extending from the car strike contacts at the side of the track, closing signal and control circuits.

901,669. Multiparty-line Telephone-exchange System. Garrison Babcock, Rochester, N. Y., assignor to the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Application filed August 4, 1904.

The central office is signaled by a passing contact closed momentarily as the hook rises.

901,683. Supervisory System. Merritt S. Conner, Chicago, Ill., assignor to the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Application filed March 5, 1904.

Details of the cord circuit are described.

901,684, 901,685, 901,686, 901,689. Telephone-exchange Systems. Merritt S. Conner, Rochester, N. Y., assignor to the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Applications filed January 24, 1906, to January 23, 1907.

Circuits for a telephone system are given.

901,687. Telephone Transmitter. Merritt Conner, Rochester, N. Y., assignor to the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Application filed December 18, 1906.

The two electrodes are placed side by side and vibrate with the diaphragm.

901,688. Switchboard. Merritt S. Conner, Rochester, N. Y., assignor to the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Application filed December 18, 1906.

The claims describe mechanical details of design.

901,696. Telephone-exchange System. William M. Davis, Chicago, Ill., assignor to the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Application filed April 26, 1901. Renewed October 8, 1903.

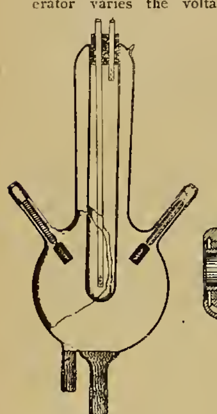
Raising the subscriber's hook-switch removes the calling generator from the circuit.

901,698. Automatic Telephone-exchange System. Bert G. Dunham, Chicago, Ill., assignor to the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Application filed October 5, 1904.

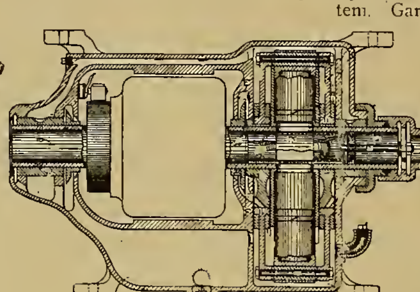
Circuits for an automatic telephone exchange system are explained in detail.

901,704. Receiver. John S. Goldberg, Chicago, Ill., assignor to the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Application filed November 23, 1903.

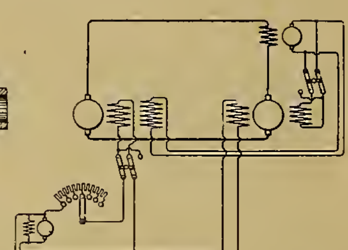
The receiver has an outer cylindrical casing consisting of a continuous one-piece shell of magnetic material of which diametrically opposite regions are oppositely polarized.



No. 901,427.—VAPOR ELECTRIC APPARATUS



No. 901,499.—MOTOR COMPRESSOR



No. 901,514.—MOTOR CONTROL SYSTEM

901,706. Cable Support. Elbert A. Hawkins, Baldwin, N. Y., assignor to the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Application filed December 18, 1906.

A suspended swinging bracket is provided.

901,738. Subscriber's Telephone Circuit. Howard M. Post, Chicago, Ill., assignor to the Kellogg Switchboard and Supply Company, Chicago, Ill. Application filed July 31, 1905.

An auxiliary insulated contact is required on the hook-switch for this circuit. (See cut.)

901,758. Electrolyte. Abraham Van Winkle, Newark, N. J., assignor to the Hanson & Van Winkle Company, Newark, N. J. Application filed October 24, 1907.

The electrolyte comprises a fluoride of zinc solution, with carbonate of ammonia.

901,765. Magnetic Separator. Reuben I. Wright and Homer E. Frost, Cleveland, Ohio, assignors to the Electric Controller and Supply Company, Cleveland, Ohio. Application filed May 10, 1907.

The switch controlling the magnet excitation is controlled by the ore valve.

901,785. Telephone System. Elmer R. Corwin, Chicago, Ill., assignor to the Corwin Telephone Manufacturing Company, Chicago, Ill. Application filed December 26, 1906.

Details of the telephone-exchange and subscriber's circuits are given.

901,816. Trolley-wire Anchor. Allan McIsaac, Hartford, Conn. Application filed March 4, 1908.

A bridge piece, secured by bolts, holds the trolley wire in position.

901,847. Electric Mail-delivering and Collecting Machine. Otto E. Stout, Ozark, Ill. Application filed June 30, 1908.

The carrier travels on a double trackway, which also serves as the supply and return conductor.

901,861. Telegraphic Sounder. Vincent C. de Ybarrondo, Los Angeles, Cal. Application filed May 6, 1907.

The arms of a U-shaped metal member are adjustable.

901,869. Protector for Telephone Transmitters. Josef Baumgarten, New York, N. Y. Application filed January 18, 1908.

A collapsible funnel of flexible material is inserted in the transmitter shell.

901,871. Electric Heater and Drier. George N. Blanchard, San Francisco, Cal., assignor of one-half to the Electric Manufacturing Company, San Francisco, Cal. Application filed February 21, 1908.

A helical electric-heating coil is inserted in the blower passage of an electrically driven fan.

901,878. Trolley-wheel Bearing. William M. Caswell and Joseph A. Schofield, Warren, Pa. Application filed December 16, 1907.

The bearing is formed of hinged and fixed bearings.

901,885. Electric Contact Spring for Trolley Harps. Albert L. Cole, Auburndale, Mass., assignor to the United Copper Foundry Company, Boston, Mass. Application filed September 28, 1905.

Elastic combined washers and contact springs are mounted between the hub of the wheel and the harp.

901,894. Indicator for Telephone Calls. Eugene T. Ducharme, Boston, Mass. Application filed November 15, 1907.

The bell clapper throws a target, indicating that a call has been received.

901,899. Electric Signaling System for Railways. William J. Higgins and Christopher J. Sheridan, Buffalo, N. Y. Application filed December 27, 1907.

The system is adapted for use with 500-volt alternating current.

PATENTS THAT HAVE EXPIRED

Following is a list of electrical patents (issued by the United States Patent Office) that expired October 27, 1908:

461,808. Electric-car Brake. La Motte C. Atwood, St. Louis, Mo.
461,810. Signaling System. F. P. Benjamin, New York, N. Y.
461,851. System of Distribution for Electric Railways. S. H. Short, Cleveland, Ohio.
461,862. Electric Generator. C. G. Young, New York, N. Y.
461,887. Multiple System for Telephone Exchanges. Wm. E. McKivitt, St. Paul, Minn.
461,898. Incandescent Electric-lamp Socket. C. P. Poole, Lynchburg, Va.
461,965. Galvanic Battery. C. N. Souther, Chicago, Ill.
461,969. Electric Railway. Wm. B. Vansize, Plainfield, N. J.
461,979. Dynamo-electric Machine or Motor. M. Mayer, New York, N. Y.
462,014. Electric Railway. G. W. McNear, Oakland, Cal.
462,020. Automatic Regulator for Dynamo-electric Machines. Wm. L. Silvey, Lima, Ohio.
462,022. Electric Railway Switch. H. C. Spaulding, Boston, Mass.
462,153. Underground System for Electric Railways. S. D. Nesmith, Cleveland, Ohio.
462,177. Electric Railway. C. W. Thomas, New York, N. Y.

ANNUAL FALL TRADE NUMBER.

Western Electrician

Vol XLIII. $3.00 Per Annum. Copyright, 1908, by Electrician Publishing Company, Chicago. CHICAGO, OCTOBER 3, 1908. Entered at Chicago Postoffice as mail matter of the second class 10 Cents a Copy. No. 14

STREET AND INTERURBAN
RAILWAY POWER PLANTS

EQUIPPED WITH A BATTERY OF

"Chloride Accumulators"

—SECURE—

A FLEXIBILITY OF OPERATION and an ADJUSTMENT OF THE LOAD

OBTAINABLE IN NO OTHER MANNER

THE ELECTRIC STORAGE BATTERY CO.

1888 **PHILADELPHIA** 1908

New York · Boston Chicago St. Louis Cleveland Atlanta San Francisco Toronto

Insulated Staples

*1

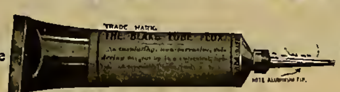
4 Sizes

Pat. Nov., 1900

*3

Blake Tube Flux for Soldering

Full Size of Tube 1″ x 5″



Patented February 4th 1908

WRITE FOR SAMPLES

BLAKE SIGNAL & MFG. CO., 246 Summer St., Boston Mass.

Compressed Cleats

FOR USE ON PLASTERING

EXACT SIZE PAT. JULY 1906

PLATINUM

Resistance Wires to Specifications
Rivets and Contacts
Wollaston Wire for Wireless Telegraphy
Send for Catalogue

GRAND PRIZE Universal Exposition, St. Louis, 1904
GOLD MEDAL Lewis and Clark Centennial Exposition, Portland, 1905.
GOLD MEDAL Jamestown Exposition, Jamestown, 1907.

C. O. BAKER, Pres. G. W. Baker, Vice-Pres.

BAKER & CO., Inc.

408-414 Sys. R. R. Avenue, NEWARK
NEW YORK OFFICE, No. 30 Church St.

ALPHABETICAL INDEX TO ADVERTISEMENTS.

For Classified Index of Advertisements See Page 6.

HEADQUARTERS FOR THE BEST OF EVERYTHING IN

ELECTRIC LIGHTING SUPPLIES

Wires Cords Cables Cut-Outs Arc Lamps Switches Globes
Sockets Brushes Dynamos Dynamo Parts Cored and Solid Carbons Electric Fans
Electric Heating and Cooking Utensils Motors HYLO Lamps
Miniature Decorative and all kinds of Incandescent Lamps Electric Portable Lamps for Office Use.

COMMONWEALTH EDISON COMPANY

ELECTRIC LIGHT AND POWER

Telephone Main 1280 Edison Building, 139 Adams Street, CHICAGO

"FLEXDUCT"

The most flexible Non-Metallic Conduit made. Tough. Strong. Does not stretch. Does not Crack or Break. Kinking or smashing does not destroy smooth, uniform interior.

Easiest Fished. Saves Labor. Cuts off clean. No Waste.

SEND FOR SAMPLE

National Metal Molding Company, Pittsburg, Pa.

Branches: New York Boston Chicago St. Louis San Francisco

TRIUMPH

GENERATORS AND MOTORS FOR ANY SERVICE

Our Booklet, "The Way to Forget"

TRIUMPH ELECTRIC CO., - Cincinnati, Ohio

CARBON BRUSH AILMENTS

Diagnosis: LOW CONDUCTIVITY
POOR COMMUTATION
HIGH TEMPERATURE
CUT COMMUTATOR
BURNED-OUT SEGMENTS

℞ *Use*

"Le Valley Vitae Carbon Brushes"

One Application

Endorsed by manufacturers of Electric Machines in nearly every country in the world. For fifteen years the Standard Carbon Brush. Write for Testimonials.

Le Valley Vitae Carbon Brush Co.
405 East Tremont Avenue New York City

Push-Button Pendent Lamp Socket

Suitable for use with any type of Edison base lamp not exceeding 50 candlepower at 250 volts. Made of porcelain in plain white and colored glazes. Will not tarnish like ordinary metal sockets.

Symmetrical in appearance—note the push-button mechanism which replaces the old-fashioned key. Catalog No. 7400. This is one of our new line of push-button specialties, National Electrical Code Standard.

SEND FOR BOOKLET DESCRIBING FULL LINE

THE CUTLER-HAMMER MFG. CO., MILWAUKEE

NEW YORK OFFICE, Hudson Terminal (50 Church Street)
CHICAGO, Monadnock Block, PITTSBURG, Farmers' Bank Building — BOSTON, 176 Federal Street
Pacific Coast Agents, OTIS & SQUIRES, 111 New Montgomery St., San Francisco, Cal.

NOTICE

All Operators of Flaming Arc Lamps are hereby notified that we are making SPECIAL PRICES on CARBONS for these Lamps and that they can SAVE MONEY by purchasing them from us.

NATIONAL CARBON COMPANY, CLEVELAND, O.

CLASSIFIED INDEX OF ADVERTISEMENTS.

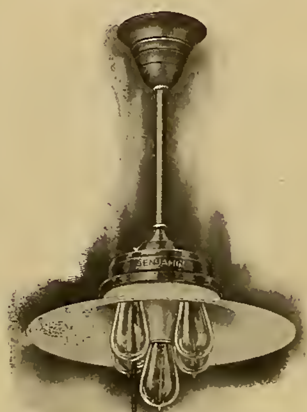
For Alphabetical Index of Advertisements See Page 3.

LIGHTING PROBLEMS EASILY SOLVED

BY USING

BENJAMIN TUNGSTEN ARCS

Scientifically Constructed to Meet Any and Every Lighting Requirement.



Indoor Form. 18-in. Opal Reflector. Brush Brass Finish. 25 inches over all. Cat. No. T45K. 4 to 6 Lights.

INDOOR

Enclosed Indoor Form. 18-in. Opal Reflector. Brush Brass Finish. 25 inches over all. Cat. No. T84. 3 to 5 Lights.

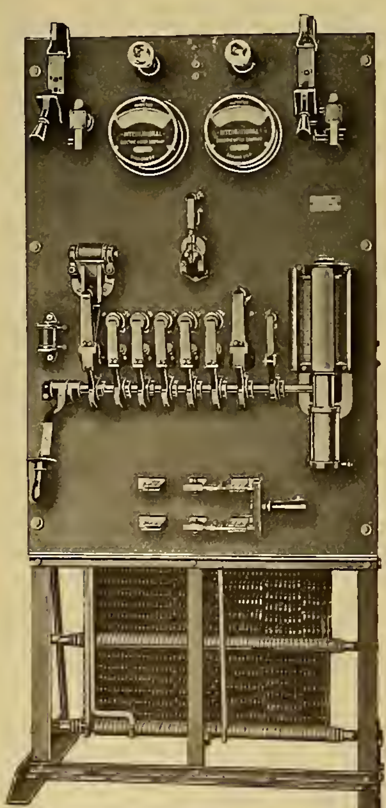
OUTDOOR

Weatherproof Form. 18-in. Enameled Steel Reflector—8x10-in. Ball. 21 inches over all. Cat. No. T63. 2 to 4 Lights.

Write for new Catalog B-18 showing new fixtures and specialties.

BENJAMIN ELECTRIC MFG. CO.

NEW YORK CHICAGO SAN FRANCISCO



100 H. P., 220 V., Type "E H"
DIRECT CURRENT

"SCHUREMAN" FIRE-PUMP STARTERS

FOR

Motor-Driven Centrifugal Pumps

ON

Sprinkler Systems.

The Type "EH" Starter is a combined hand and automatic starter, designed especially for the control of motor-driven fire pumps operating on sprinkler systems and in accordance with the requirements of the fire underwriters for such installations.

The automatic feature is controlled by a pressure regulator and starts and stops the pump automatically on limits of pressure. By means of the hand-starting feature, the pump can be started at any time by hand, independently of the automatic control. The main line and accelerating switches are opened and closed by means of a series of cranks mounted on a shaft, which is revolved in one case by a solenoid and in the other case through a hand-operated lever. The use of a single operating unit in each case renders the operation so simple that the outfit is practically "fool-proof" and is always ready for action in case of fire.

Information and Prices on request

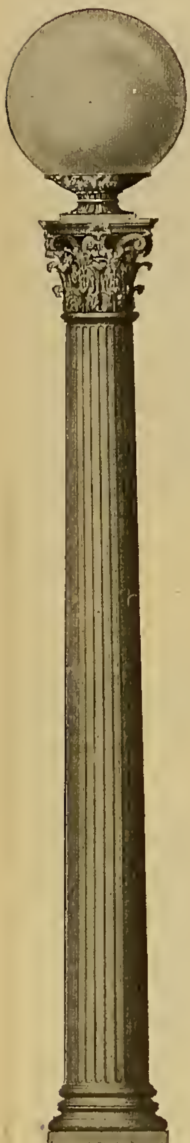
We also manufacture the most complete line of Elevator Controllers and Self-Starters on the market, both direct and alternating current. Write for Catalogue.

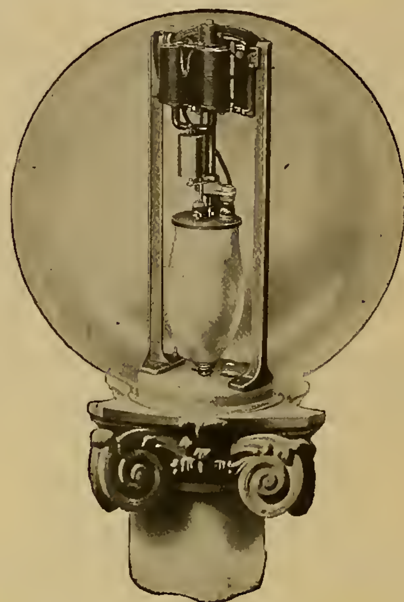
J. L. SCHUERMAN CO.

70-86 W. Jackson Boul., - - - CHICAGO

NEW YORK: 95 Liberty Street PHILADELPHIA: 1328 Chestnut Street

DANIELS BOULEVARD LIGHTING SYSTEM





Artistic Lighting Fixtures for Street and Park Illumination

Upon re-enforced concrete columns of classic design are mounted Jandus Arc Lamp mechanisms enclosed within 20-inch opal glass ball globes.

The Lamp is of the regular enclosed type with the Jandus patented diffusion chamber, takes a four-inch lower and nine-inch upper carbon and will attain an average life of 125 hours per trim.
The system has been designed to operate on Multiple Direct-current, Multiple Alternating-current and Series Alternating-current circuits.

The Large Globe gives perfect diffusion of light, eliminates the glare and travel of the arc and produces a quality ot illumination heretofore unequaled.

The Concrete Post is eleven feet in height and is molded and finished to correspond to sand-stone, marble, granite or any natural stone. It is more attractive in appearance, more durable and less expensive than the iron posts now usually employed for arc lamp support.

Comparative Advantages:

Economy in cost per unit.
Beauty of design in harmony with surroundings.
The short post brings the lamp nearer the ground where the light is most needed.
The large globe gives better diffusion, resulting in less brilliancy, but better illumination.

Detailed Information and Costs Gladly Furnished by

The Jandus Electric Company

CLEVELAND, OHIO

New York Office
114 LIBERTY STREET

Philadelphia Office
1211 FILBERT STREET

Chicago Office
23 EAST LAKE STREET

Cooper Hewitt Lamps

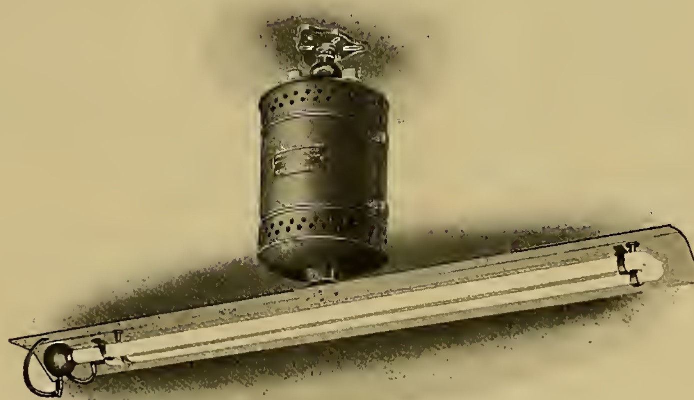
Type P—110 Volts, D. C.

New Multiple Units

Automatic Lighting

with closing of the switch

Direct and Alternating Current



Type U—220 Volts, D. C.

—FOR—

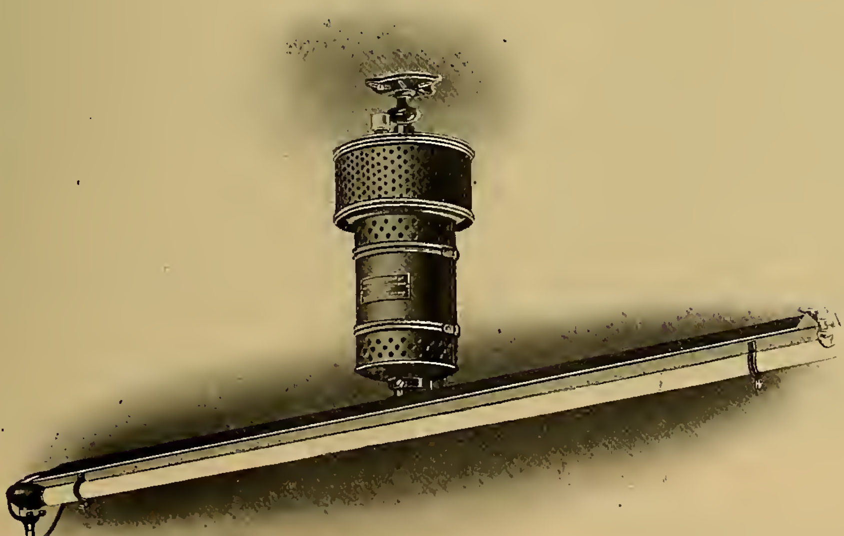
Illumination of Industrial Institutions

of all kinds from

Machine Shops

to

Silk Mills



Type F—60 Cycle, A. C.

Proposals for Lighting any Plant will be Furnished upon Application.

Write for Bulletins describing the New Units.

COOPER HEWITT ELECTRIC COMPANY

General Offices and Works: 220 West 29th Street, New York

District Sales Offices: Albany, N. Y., 66 State St.; Boston, Mass., 161 Summer St.; Chicago, Ill., 40 Dearborn St.; Cincinnati, Ohio, 1107 Traction Bldg.; Philadelphia, Pa., 124 S. 8th St.; Pittsburg, Pa., 715 Wabash Bldg.

HYLO-ECONOMICAL

TURN DOWN LAMPS

Made by the Economical Lamp Co., 94 Warren St., New York

No. 1

8 x ½
16 x 1
32 x 1

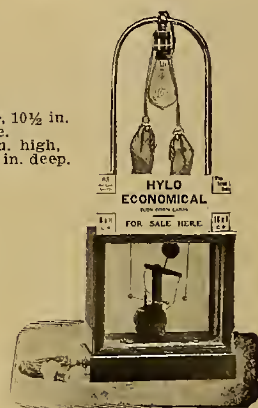
ECONOMICAL "PULL STRING"

No. 7

8 x ½ out
16 x 1 out
32 x 1 out

HYLO "PULL STRING"

Size, 10½ in. wide.
30 in. high,
5½ in. deep.



MECHANICAL MACHINE

No. 2

8 x ½
16 x 1
32 x 1

ECONOMICAL "TURN BULB"

No. 6

8 x ½ out
16 x 1 out
32 x 1 out

ECONOMICAL "LONG CORD"

To THE TRADE:

We have purchased the Copyrighted Trade mark "HYLO" and all Patents on "HYLO" Lamps and are prepared to furnish promptly "HYLO" Pull String in addition to our Standard and well-known types, "PULL STRING," "TURN BULB" and "LONG CORD" "ECONOMICAL" Turn-Down Lamps.

For a Window or Show Room EYE-CATCHING DEMONSTRATOR we have had perfected a most NOVEL AND ATTRACTIVE MECHANICAL (WORKED BY ELECTRICITY) MACHINE, all ready to connect to socket with HANDS which PULL the STRINGS, changing the light from HIGH to LOW and LOW to HIGH constantly (until current is turned off); this machine is the BEST KNOWN SUBSTITUTE for a REAL ALIVE DEMONSTRATOR and will be the means of selling the article quicker; no time is lost in explaining.

Where One Hundred or more "HYLO-ECONOMICALS" are bought a machine will be loaned for two months.

In anticipation of an increased demand for the "Fall Trade" we have manufactured a complete stock of all types, in all voltages, and can make prompt shipments.

Kindly consider this and ORDER EARLY, as we will only have a limited number of MACHINES to start with and they will be loaned in ROTATION as ORDERS are received.

PRICE SHEET

C. P. 8 x 1-2 16 x 1. VOLTAGE 60 TO 130

		Less than 100	100 or less than case	Case (250)
No. 1. Pull String "Economical"	–	.45	.42½	.40
No. 2. Turn Bulb "Economical"	–	.45	.42½	.40
No. 6. Long Cord "Economical" (Complete with three feet of cord and switch.)	–	.96	.91	.86
No. 7. Pull String **"HYLO"** –	–	.47	.44½	.42

ADDITIONAL CHARGES

High Volt (200 to 250 volt.)	– –	.05 cents per lamp
32 C. P. x 1 C. P. (50 to 130 volt.)	–	.10 cents per lamp
32 C. P. x 1 C. P. (200 to 250 volt.)	–	.15 cents per lamp
FROSTING	– – – – –	.05 cents per lamp

Cord for LONG CORD LAMP .03 cents per foot over 3 feet (furnished any length).

Lots of case, 100 or less than case, less than 100 can be assorted in all types, C. P. and voltages.

Each lamp is packed in cardboard carton

TEAR OFF, FILL IN, SIGN AND ATTACH TO ORDER

....1908.

Economical Electric Lamp Co., 94 Warren St., New York

Gentlemen:

Enclosed herewith you will find Order No.....................for....................Turn Down Lamps; voltage, candlepower and type is specified.

This order is placed on condition that you loan me/us a MECHANICAL MACHINE for a period of TWO MONTHS; after the expiration of the loan period I/we agree to return the MECHANICAL MACHINE in good condition, same to be packed in case originally shipped to me/us.

Respectfully yours,

....

CAN BE INVOICED THROUGH YOUR SUPPLY DEALER IF SO DESIRED

SEND ORDER ON YOUR OWN FORM


THIS STANDS FOR QUALITY
NOBLAC INNER GLOBES
Point 4
H. R. NOBLAC Inner Globes are made in all the standard sizes and to meet all requirements for both commercial and street lighting purposes. We carry an immense stock always on hand and can guarantee prompt shipments.
Write for prices and particulars
THE FOSTORIA GLASS SPECIALTY Co. FOSTORIA, O.

THE ARNOLD COMPANY
ENGINEERS-CONSTRUCTORS
ELECTRICAL—CIVIL—MECHANICAL
181 LA SALLE STREET
CHICAGO

BYLLESBY, H. M. & CO.
(Incorporated)
ENGINEERS
Design, Construct and Operate Railway, Light, Power, Hydraulic and Gas Plants.
Examinations and Reports
American Trust Bldg. CHICAGO, ILL.

KOHLER BROS.
Contracting Electrical Engineers, Lighting, Power, Railways.
1804-1806-1808-1810-1812 Fisher Bldg.
CHICAGO.

RUEBEL & WELLS
CONSULTING, MECHANICAL AND ELECTRICAL ENGINEERS
Suite 301 Chemical Building,
ST. LOUIS, U. S. A.

F. B. BADT & CO.
ENGINEERS
Agents for Weston Instruments, Ward Leonard Rheostats, etc.
1504 MONADNOCK BLOCK, CHICAGO
Telephone Harrison 745

ROBERT W. HUNT & CO.
ENGINEERS
Chicago, 1121 The Rookery
New York, 90 West Street
Pittsburg, Monongahela Bank Bldg.
London, Cannon St., E. C. London
San Francisco, 425 Washington St.
St. Louis, Syndicate Trust Bldg.
Montreal, Canadian Express Bldg.

CHARLES L. PILLSBURY
CONSULTING MECHANICAL and ELECTRICAL ENGINEER
Consulting Engineer to Minnesota State Board of Control
Suite 206, Metropolitan Life Building,
MINNEAPOLIS, MINN.

A LITTLE CARD
in this Directory may bring a big customer.
TRY ONE!

TRY IT
Keep your name and address in this Directory where it will be seen by possible clients.

D. C. & WM. B. JACKSON
Members American Institute of Electrical Engineers. American Society of Mechanical Engineers. American Society of Civil Engineers.
ENGINEERS. EXPERTS.
CHICAGO BOSTON

A WEEKLY REPRESENTATION
in this "Directory" enables engineers to keep before all possible customers.

Long Distance Phone Central 498
SCHOTT, W. H.
ENGINEER AND CONTRACTOR
SPECIALTIES—Central Station Heating Plants, Water Works, Steam Plants, Electric Light, Gas and Street Railway Plants.
1100-1128 American Trust Bldg., Chicago

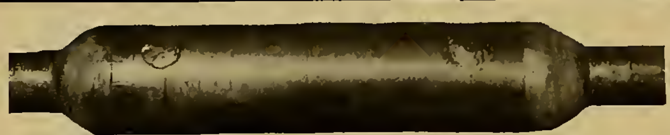
W. F. BRENNAN, Pres. F. W. BLOCKI, Treas.
J. P. EARLY, Secy.
BRENNAN ELECTRIC CONSTRUCTION COMPANY
330 Dearborn St., Chicago
High Tension Transmission Lines
Heavy Electric Cable Work—Electric Railway Construction—Isolated Electric Light Plants—All Kinds of Electric Wiring.

ENGINEERING BOOKS
We can fill orders for any engineering book published.
ELECTRICIAN PUBLISHING CO.
507 Marquette Bldg., Chicago

RADFORD, JOHN A.
ENGINEER
Plans, Specifications, Reports, Tests. Estimates and Supervision for Complete Steam and Electrical Installations.
1325-1326 Marquette Bldg., CHICAGO, ILL.

YOU DON'T KNOW
how many customers you fail to get by not having your name in this Directory.

INNER ARC GLOBES
INCANDESCENT BULBS AND TUBING
WRITE FOR PRICES
THE LIPPINCOTT GLASS CO., ALEXANDRIA, IND.



Central Station Letters—No. 2

NONSENSE! CABLE JOINT FAILURES MEAN INFERIORITY, NOTHING ELSE

Under the old regime, with other compounds, it has seemed to be considered as a matter of course that certain failures in underground cable jointing in high-tension lines were to be expected. Absolute bosh! Not THEN, of course, with inferior insulating compounds but NOW with Minerallac in the field and a record of six years on 420 miles of high-tension cable and only one failure, this produced externally.

Mr. Central Station Man, we want to get down to brass tacks with you! We want to get you in the Minerallac band wagon. Get the facts! Get our catalogue E. Get the unequaled, absolutely best insulating compound in the world.

Bring your cable troubles to us.

MINERALLAC COMPANY, 841 Monadnock Block, Chicago

Columbia Meters
ARE
EASY TO READ, ACCURATE, MEDIUM PRICED, SMALL IN SIZE.

Write for prices and circulars

COLUMBIA METER CO.
INDIANAPOLIS, IND.

Fixture No. 2274

Length, 36 in.
Spread, 18 in.

Tungsten Lamp Fixtures

List Prices.	Discounts to Dealers. Not Wired	Wired	Complete as shown except lamps
3-Lt. Brush, Brass	$3.30	$4.30	$ 7.60
4 " "	3.95	5.45	9.85
5 " "	4.60	6.60	12.10

The complete price includes roughed inside or opal shades.

Holophane reflectors furnished if desired at additional cost.

Send us a sample order, and write us regarding our full *Tungsten line.*

BEARDSLEE
Chandelier Mfg. Co.
180 S. Clinton St., Chicago

Rock Crystal Chandeliers
Ceiling, Drop and Wall Lights
Cut Portable Lamps and Shades
Globes, Cut and Iridescent
Crystal Prisms

As direct representative of German manufacturers, I am prepared to quote wholesale European prices and provide transportation facilities to land goods at your store in sample lots at minimum quantity rates to trade only. This courtesy will be appreciated.

R. E. RICKENBAUGH & CO.
Grand Rapids, Mich.

IMPORTANT NOTICE

To meet the constant demand for helpful information on the principles and uses of alternating current, the WESTERN ELECTRICIAN begins, in this issue, the publication of a new serial bearing the title

"ALTERNATING CURRENTS AND THEIR APPLICATIONS"

This series of articles will prove of especial value to the practical man. The elementary principles will be fully and clearly established, only simple mathematics will be used and everything will be set forth in a language which should be easily understood. The author of this serial is Mr. E. R. Wolcott, formerly professor of Physics and Electrometallurgy in the Colorado School of Mines. The articles will be clearly illustrated. The subject outline of the serial is as follows:

ALTERNATING CURRENTS AND THEIR APPLICATIONS.

I.—GENERAL PRINCIPLES.

1. Introduction.
   Advantages of alternating currents; comparison with direct currents; mechanical analogies.
2. Generation of Alternating Currents.
   Direct-current reversal; graphical illustration; cycle; frequency; sine curve; production of alternating currents; collecting rings; pendulum analogy; electromotive force curve; the alternator.
3. Measurement.
   Effective value of current; maximum value of current; comparison of voltmeter and ammeter construction.
4. Transmission.
   Electrical energy; loss in transmission; advantage of high voltage; transformers.
5. Induction.
   Fundamental principle of alternating currents; self-induction; effect of iron; solenoid; mutual induction.
6. Transformer.
   Principles of the transformer; ratio of voltage; efficiency; copper losses; hysteresis; eddy currents.
7. Impedance.
   Opposition to the flow of an alternating current; inductance; permeability; effect of frequency; reactance; use of π; the henry; ohmic resistance; reactance; expression for impedance.
8. Graphical Representation.
   Components of electromotive force; calculation of inductance; curves of component electromotive forces; applied electromotive force; phase.
9. Power.
   Calculation of power; power curves; lagging current; power factor.
10. Polyphase Currents.
    Definition; advantage; two-phase system; two-phase three-wire system; three-phase system; star connection; delta connection; current and voltage relation in star connection; current and voltage relation in delta connection; receiving circuit; power; economy.
11. Capacity.
    Electrostatic induction; condenser; capacity of ordinary electrical systems; condenser in alternating-current circuit; balance of inductance by capacity; the farad calculation of capacity reactance; alternating-current curves; tuning electrical circuits.

II.—GENERATORS.

1. General.
2. Rotating Armature.
   Types, electromotive force; method of winding; exciting current; magnetic saturation; relation between terminal voltage and load; series-wound alternator; shunt-wound alternator; separately excited alternator; composite excitation.
3. Rotating Magnetic Field.
   Advantages; details of construction; separate excitation; composite excitation; ventilation; voltage control.
4. Inductor Alternator.
   Principles of.
5. Operations of a Generator.
   General; collecting rings; commutator; brushes; bearings; starting; causes of insufficient voltage; static sparks from belts; shutting down.
6. Parallel Operation.
   Synchronism; two-phase alternators; three-phase alternators; methods of synchronizing; conditions for parallel operations; hunting; phase; capacity.

III.—MOTORS.

1. General.
2. Synchronous.
   Principles of; details of construction; necessity for exact synchronism; prevention of hunting; starting.
3. Induction.
   Principles of; details of construction; advantages; induction of current in the rotor; operation of; rotating magnetic field; speed and torque; rating; starting; compensators; single-phase induction motors; starting of phase splitters.
4. Repulsion Motors.
   Principles of; details of construction; advantages.
5. Single-phase Series.
   Principles of; compensation of armature inductance; prevention sparking; advantages of.

IV.—TRANSFORMERS.

Essentials of transformer construction; core type; shell type; type H; mounting of; cooling of; water cooled; air cooled; efficiency; iron losses; copper losses; all-day efficiency; regulation; connection subdivided coils; parallel connections; auto-transformers; polyphase transformer; Δ Y and V connections; change of phase; constant current.

V.—ROTARY CONVERTERS AND MOTOR GENERATORS.

1. Advantages of; uses of; voltage; compounding; starting; inverted rotary converters; use of transformers with connections.
2. Motor Generators.
   Advantages.

VI.—LIGHTING.

1. General.
2. Arc Lamps.
   Enclosed; flaming.
3. Incandescent Lamps.
   Carbon; Gem; tantulum; temperature coefficient of metallic filaments; tungstens.
4. Nernst Lamps.
   Principles of; advantage.
5. Vapor Lamps.
   Discharge of electricity through gases; mercury vapor; vacuum lamps.

VII.—THERMAL APPLICATIONS.

1. Electric Heating.
2. Electric Furnaces.
   Calcium carbide; graphitizing electrodes.
3. Induction Furnaces.

VIII.—TRANSMISSION.

1. General.
   Effect of atmospherical conditions; insulation analogy; electrical surges; insulators; silent discharge; aging of insulation.
2. Protective Devices.
   Principles of lightning arrester; induction of straight wires; effect of frequency; horn arrester; non-arcing metal arresters; multi-path arrester; use of choke coil; connections; electrolytic arrester; grounded ærial wires; protection of low-tension side of transformers; grounds; suspended insulators; underground transmissions.

IX.—SWITCHBOARD AND REGULATION.

1. Principles Used in Measurement.
2. Indicating and Recording Instruments.
   Voltmeter; ammeter; wattmeter; phase meter; frequency indicator; integrating wattmeters; prepayment wattmeters; recording instruments; ground detectors.
3. Switches and Automatic Cutouts.
4. Controlling Devices.
   Tirrell Regulator.
5. Oscillographs.

X.—SUMMARY.

SPECIAL OFFER

On receipt of $3.00 we will enter your subscription to the WESTERN ELECTRICIAN and send the paper from the date order is received until **January 1, 1910**, to any point in the United States. Fill out and return the coupon herewith so as not to miss any of the issues containing the serial on Alternating Currents. The quicker you send in your order the more copies of the paper you will receive.

WESTERN ELECTRICIAN

507 Marquette Building

CHICAGO

COUPON

Date

ELECTRICIAN PUBLISHING CO.
507 Marquette Building
Chicago.

Enclosed find $3.00 for which send me the WESTERN ELECTRICIAN from date to January 1, 1910, as per your special offer.

THE NEW FOSTER

Fifth Edition. Completely Revised and Enlarged, with Four-fifths of Old Matter Replaced by New, Up-to-date Material. Pocket size, flexible leather, 1,100 pp., diagrams, thumb index, etc.
Price, $5.00

Electrical Engineer's Pocketbook

The Most Complete Book of Its Kind Ever Published, Treating of the Latest and Best Practice in Electrical Engineering

By HORATIO A. FOSTER

Member Am. Inst. E. E., Member Am. Soc. M. E.

(With the collaboration of eminent specialists)

CONTENTS

Symbols, Units, Instruments
Measurements
Magnetic Properties of Iron
Electromagnets
Properties of Conductors
Dimensions of Conductors for Distribution Systems
Underground Conduit Construction
Cable Testing
Dynamos and Motors
Tests of Dynamos and Motors
The Static Transformer
Standardization Rules
Electric Lighting
Electric Street Railways
Electrolysis
Transmission of Power
Storage Batteries
Switchboards
Lightning Arresters
Electric Meters
Wireless Telegraphy
Telegraphy
Telephony
Electricity in the U. S. Army
Electricity in the U. S. Navy
Resonance
Electric Automobiles
Electro-chemistry and Electro-metallurgy
X-rays
Electric Heating, Cooking and Welding
Lightning Conductors
Mechanical Section
Index

ELECTRICIAN PUBLISHING CO.
Publishers of and Dealers in Electrical Books
507 Marquette Bldg., Chicago

Books For Central Station Men

Entirely New and Revised Edition
8vo, Cloth, with Diagrams and Illustrations.
PRICE, $3.00

ELECTRIC LIGHTING
Volume 1
The Generating Plant
BY
Francis B. Crocker E. M., Ph. D.
Professor of Electrical Engineering in Columbia University, Past President of the American Institute of Electrical Engineers.

8vo, Cloth, 337 pp, 220 Illustrations. Price net $4.00

ELECTRICITY METERS
Their Construction and Management
A Practical Manual for Central Station Engineers, Distribution Engineers, and Students
BY
C. H. W. GERHARDI

8vo, Cloth, 266 Pages, Illustrated. Price $4.00 net

Modern Turbine Practice
AND
Water-Power Plants
BY
JOHN WOLF THURSO
Civil and Hydraulic Engineer

8vo, Cloth, 505 pages, Illustrated. PRICE, $3.00

Electric Lighting
A Practical Exposition of the Ar
FOR THE USE OF ELECTRICIANS STUDENTS AND OTHERS.
BY
Francis B. Crocker, E. M., Ph. D.
Volume II.—Distributing System and Lamps

Sixth Edition, Thoroughly Revised and Enlarged—1906
12mo, Cloth, 250 pages, 134 Illustrations
PRICE $1.00 net

THE MANAGEMENT OF ELECTRICAL MACHINERY
A Thoroughly Revised and Enlarged Edition of the Practical Management of Dynamos and Motors.
BY
Francis B. Crocker, E. M., Ph. D.
AND
Schuyler S. Wheeler, D. Sc.
President Crocker-Wheeler Company; President of the American Inst. of Electrical Engineers; Member American Society of Civil Engineers; Member American Society Mechanical Engineers.

12mo, Cloth, 345 pp, Illustrated. Price $3.00 net

Long-Distance Electric Power Transmission
BEING A TREATISE ON THE
Hydro-Electric Generation of Energy; Its Transformation Transmission and Distribution.
By
ROLLIN W. HUTCHINSON, Jr.
Consulting Electrical Engineer; Associate Member American Institute of Electrical Engineers, and Member of the Electrochemical Society.

Electrician Publishing Co.
507 Marquette Bldg.
Chicago, Ill.

TECHNICAL LIBRARIES

of institutions or individuals lacking any of the standard publications listed below will do well to note the prices at which they are offered :

	List Price.	Sale Price.
Primary Batteries, by W. R. Cooper, M. A., London, 1901	3.00	2.60
Electricity for Engineers, by Chas. Desmond, Chicago, 1899	3.50	.90
Practical Photometry, a Guide to the Study of the Measurement of Light, by Wm. Joseph Dibdin, London, 1889	3.00	2.00
Alternating-current Transformers in Theory and Practice. Vol. 1, The Induction of Electric Currents, by J. A. Fleming, M. A., London, 1900	5.00	3.60
Vol. 2, The Utilization of Induced Currents	5.00	3.60
The Art of Electrolytic Separation of Metals, by G. Gore, LL. D., London	3.50	2.00
Absolute Measurements in Electricity and Magnetism, by Andrew Gray, M. A., London, 1893	1.25	1.00
Electric Heating, by Edwin J. Houston, Ph. D., and A. E. Kennelly, Sc. D. New York, 1895	1.00	.60
Magnetism, by Edwin J. Houston, Ph. D., and A. E. Kennelly, Sc. D., New York, 1895	1.00	.60
Dynamos, Motors, Alternators and Rotary Converters, by Gisbert Kapp, London, 1902	4.00	2.75
Conductors for Electrical Distribution, Their Materials and Manufacture, by F. A. C. Perrine, A. M., New York, 1903	3.50	2.30
Practical Lessons in Electricity, selected from the text-books in the Electrical Engineering Course of the American School of Correspondence at Armour Institute of Technology, Chicago, 1903	....	1.50
The Incandescent Lamp and Its Manufacture, by Gilbert S. Ram, A. I. E. E., London	3.00	2.00
Everybody's Handbook of Electricity (paper), by Edward Trevert, Lynn, 1901	.25	.10
Experimental Electricity, by Edward Trevert, Lynn, 1903	1.00	.60
Practical Directions for Electric Gas Lighting and Bell Fitting for Amateurs, by Edward Trevert, Lynn, 1901	.50	.25
How to Build Dynamo Electric Machinery, by Edward Trevert, Lynn, 1902	2.50	1.35
Electro-metallurgy Practically Treated, by Alexander Watts, F. R. S. S. A., New York, 1901	1.00	.60
Electrical Rules, Tables, Tests and Formulæ, by Andrew Jamieson, C. E., New York, 1889	.75	.40
Motor Power and Gearing for Electrical Machinery, by E. T. Carter, C. E., London, 1896	5.00	1.00
Patented Telephony, Chicago, 1897	1.50	.30
Derivations of Practical Electrical Units, by Lieut. F. B. Badt and Prof. H. S. Carhart, Chicago, 1890	.75	.15
Domestic Electricity for Amateurs, translated from the French of Hospitalier, London, 1889	3.50	.40
Continental Electric-light Central Stations, Killingworth Hedges, London, 1892	6.00	.50
Electricity in Modern Life, by G. W. De Tunzelmann, London, 1889	1.25	.35
Electricity in Daily Life, by Pope, Wetzler, Webb, Kennelly and others, New York, 1893	3.00	1.50
Universal Wiring Computer, by Carl Hering, New York, 1891	1.00	.80
Electric Railway Engineer, by Edw. Trevert, Lynn, 1893	2.00	.65

We have but a few copies of each (of some but a single copy). It would be well, therefore, to send your order without delay and gain the advantage of an early choice.

ELECTRICIAN PUBLISHING COMPANY 507 Marquette Bldg. CHICAGO

This Trade Mark is Backed by 31 Years' Active Experience in the Manufacture of Electrical Equipment for Every Kind of Service

Install a Western Electric Intercommunicating Telephone System and perfect your organization. Your employees' time is valuable to you. This system will save each of your employees time, eliminate delays and mistakes.

Let us send you a copy of our booklet, "Are You in Touch With Your Plant?"

"CONSULT THE MAP"

"WRITE OUR NEAREST HOUSE"

Western Electric Hawthorne Short Arc Lamps are only 20 inches in height. They will burn 100 hours with one trimming, and give a well diffused white light that possesses the qualities of natural sunlight.

Send for our Bulletin No. 209 on Arc Lamps.

Western Electric Motor Drive will save you 25-40 per cent. on your power expense. They are made in all sizes, suited for every class of work, in both the direct and alternating current types.

Write for our Bulletin, "Save 25-40 Per Cent. on Your Power Expense."

Western Electric A.C. or D.C. Turbo-Generators are made in all sizes to meet every requirement. Low maintenance and satisfactory service is assured if you specify Western Electric equipment.

Get our prices and information on Turbo-Generators.

Western Electrician

Vol XLIII. $3.00 Per Annum. Copyright 1908 by Electrician Publishing Company, Chicago. CHICAGO, OCTOBER 31, 1908. Entered at Chicago Postoffice as second class matter. 10 Cents a Copy. No. 18

"Chloride Accumulator" "Tudor Accumulator" "Exide Accumulator"

For Office Building Electric Plants

The "Chloride Accumulator"

CORRECTS THE FLUCTUATION OF VOLTAGE CAUSED BY ELECTRIC ELEVATORS. GIVES A 24-HOUR ELECTRIC LIGHT AND POWER SERVICE WITH A MINIMUM NUMBER OF HOURS' RUN OF GENERATORS. IS ALWAYS READY TO TAKE THE LOAD IN AN EMERGENCY.

THE ELECTRIC STORAGE BATTERY CO.

1888 **PHILADELPHIA** 1908

PHILADELPHIA, NEW YORK, BOSTON, CHICAGO, ST. LOUIS, CLEVELAND, ATLANTA, SAN FRANCISCO, TORONTO

Vacuum Drying, Impregnating, Insulating

Dries and impregnates with insulating compound, under vacuum, electric coils, cables, transformers, armatures, insulator pins, wood fillers, and electrical work of all descriptions.

Most modern, compact, efficient and reliable apparatus built.

BUFFALO FOUNDRY & MACHINE CO., BUFFALO, N.Y.

Resistance 60:1

this is the ratio between copper wire and

"NICHROME"

A Resistance Wire of Unusual Merit

Withstands extremely high temperatures without oxidation.
Designed especially for use in Electrically Heated Appliances.

"Better than needs be"

DRIVER-HARRIS WIRE CO., Harrison, New Jersey

GEO. T. WESTCOTT, Chicago City Representative
315 Chamber of Commerce Bldg., CHICAGO

"TURN DUST TO DOLLARS"

Central Stations, increase your day load by encouraging Vacuum Cleaning Machinery.

This is "VELVET" for you and SALES for us

GENERAL COMPRESSED AIR & VACUUM MACHINERY CO.

4436 OLIVE STREET Dept. W. E. ST. LOUIS, MO.

PLATINUM

Resistance Wires to Specifications
Rivets and Contacts
Wollaston Wire for Wireless Telegraphy
Send for Catalogue

GRAND PRIZE Universal Exposition, St. Louis, 1904
GOLD MEDAL Lewis and Clark Centennial Exposition, Portland, 1906.
GOLD MEDAL Jamestown Exposition, Jamestown, 1907.

C. O. BAKER, Pres. G. W. Baker, Vice-Pres.

BAKER & CO., Inc.

408-414 Sys. R. R. Avenue, NEWARK
NEW YORK OFFICE, No. 30 Church St.

ALPHABETICAL INDEX TO ADVERTISEMENTS.

For Classified Index of Advertisements See Page 6.

CLASSIFIED INDEX OF ADVERTISEMENTS.

For Alphabetical Index of Advertisements See Page 3.

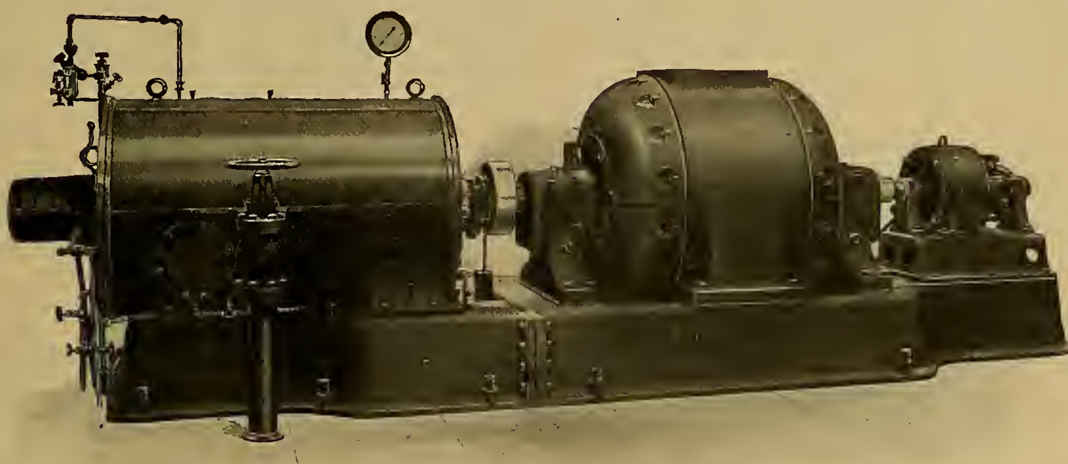
In 1907

The Western Electrician published 1,098 LARGE pages of reading matter and 1,806 illustrations. This is 3,294 columns or over 3,000,000 words. Equivalent in amount to 23 average $2 technical Books. On the book basis $46 worth given for $3. If you are not a subscriber send in your order now.

Western Electrician
507 Marquette Building, Chicago

You Can Depend Upon a Turbo=Generator with this Trade Mark

DYNAMOS-MOTORS WESTERN ELECTRIC COMPANY CABLE-TELEPHONES-SUPPLIES



DYNAMOS-MOTORS WESTERN ELECTRIC COMPANY CABLE-TELEPHONES-SUPPLIES

SIZES LARGE OR SMALL

During the twenty-seven years in which we have been manufacturing electrical power apparatus the name

WESTERN ELECTRIC COMPANY

has always stood for the highest quality. That name stands for the same standard today, and we have adapted the above trade mark so that you will know that anything you see advertised under it has been tried, tested and proved.

Let us figure on your next Turbo-Generator installation

WESTERN ELECTRIC COMPANY

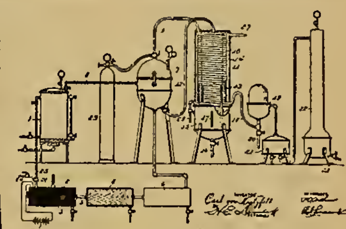
EASTERN
New York
Philadelphia
Boston
Pittsburg
Atlanta

CENTRAL
Chicago
Indianapolis
Cincinnati
Saint Paul

Write our nearest house

WESTERN
Saint Louis
Kansas City
Denver
Dallas
Omaha

PACIFIC
San Francisco
Los Angeles
Seattle
Salt Lake City



ALCOHOL FROM NATURAL GAS WILL RIVAL GASOLINE FOR LIGHT, HEAT AND POWER.

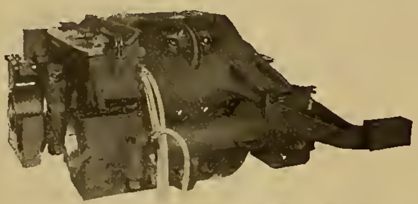
A new industry that will rival gasoline is that of denatured alcohol for light, heat and power. Five thousand feet of natural gas costs 6 cents per 1,000 feet, containing 94 per cent of methane, will produce 50 gallons of alcohol; 5 gallons alcohol equals one cord of hard wood or one and three-tenths tons of soft coal in heat units. On the basis of 100 horsepower, 10 hours' run, one year, alcohol at 30 cents per gallon approximates $234; coal at $4 per ton, $3,400; the yearly saving equals 6 per cent on a capitalization of $65,000. We propose to your commercial club to establish a new industry, manufacturing alcohol from natural gas at low cost, employing from 10 to 45 men, according to the capacity of the plant. Alcohol is a necessity on land and sea. The automobile and the navies of the world use it; the market demands it. We are ready to negotiate for this new manufacturing industry in your locality. Will you allow us to come in?

If so, address THE CONTINENTAL NATURAL GAS ALCOHOL CO., WHEELING, W. VA.

Westinghouse

Interpole D.C. Railway Motors

For All Classes of Service



No. 307, 40 H.P., 500 volts. 50 H.P., 600 volts

No. 301, 160 H.P., 550 volts. 175 H.P., 600 volts

STANDARD RATINGS

Applicable to motors for use upon existing roads, where 500-550 volts is the average or normal voltage.

Number	H.P.	Voltage
307	40	500
306	50	500
305	60	500
304	75	500
303	100	550
302	125	550
301	160	550
300	200	550

600-VOLT RATINGS

Applicable for use on such roads as may be built, to furnish an average line voltage approximating 600.

Number	H.P.	Voltage
307	50	600
306	60	600
305	75	600
304	90	600
303	110	600
302	140	600
301	175	600
300	220	600

Equipment prices are right, and substantially the same whether the motors are rated for use on 500-550 or 600 volts.

These motors will successfully commutate momentary overloads up to 100 per cent. of their rated capacity, at any voltage up to 750.

Westinghouse Electric & Manufacturing Co.

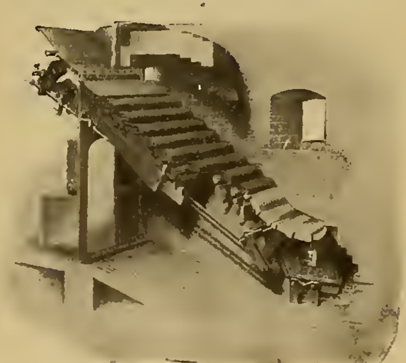
ADDRESS NEAREST DISTRICT OFFICE:

Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Kansas City, Los Angeles, Minneapolis, New Orleans, New York, Philadelphia, Pittsburg, St. Louis, Salt Lake City, San Francisco, Seattle, Syracuse.

Canada, Canadian Westinghouse Co., Ltd., Hamilton, Ontario

Mexico, G. & O. Braniff & Co., City of Mexico

The New Model Roney Stoker



New Grate Bar

has eight feet of cooling surface for every square foot of surface exposed to the fire.

New Arch Construction

by which the air supply above the fuel-bed is pre-heated and delivered at the best point to insure smokeless operation.

SEND FOR ILLUSTRATED FOLDER 4004

The Westinghouse Machine Co.

Steam Turbines, Steam Engines, Gas Engines, Gas Producers, Storage Batteries and of The Roney Stoker

New York City, 165 Broadway
Boston, 131 State St.
Cleveland, New England Building
Chicago, 171 La Salle St.
Cincinnati, Traction Building
Atlanta, Candler Building
St. Louis, Chemical Building
Pittsburg, Westinghouse Building
Philadelphia, No. American Bldg.
Denver, McPhee Building
San Francisco, Hunt, Mirk & Co.

FORT WAYNE ELECTRIC WORKS

WOOD SYSTEMS

Up-to-the-Minute

The latest improvements in design and construction are found in Fort Wayne Switchboards. They are an established department of our business for years. We know how to build switchboards.

This Switchboard

has 3 generator panels controlling 3 400-Kw. generators, 1 exciter panel controlling 2, 50-Kw. exciters, 3 arc panels controlling 3 Fort Wayne Series A. C. 50-light arc circuits and 3 three-phase feeder panels equipped with curve-drawing and recording wattmeters. It is a simple board but everything is there that is needed.

What type of board do you need? Tell us. We will send our Bulletin.

731

Sales Offices
Atlanta, Chicago, Boston, Grand Rapids, Cincinnati, New Orleans, New York

Main Office
FORT WAYNE INDIANA

Sales Offices
Pittsburg, St. Louis, San Francisco, Philadelphia, St. Paul, Syracuse, Seattle

The Mantel Type of the Luminous Electric Fireplace

Luminous Electric Fireplace permanently set in Mantel

PEOPLE begin to think of local heating devices as the cool October days come on.

¶ Every Central Station which does not show a line of the Celebrated Electric Open Fireplaces is going to miss good profitable sales.

¶ Every Electric Fireplace sold means additional current sold during every cool month.

¶ Every Electric Fireplace sold means a pleased and satisfied customer, rooting enthusiastically for you and the Fireplace—increased profits, increased good will.

¶ We are offering a special proposition to Central Stations, to buy now.

¶ Don't fail to get in.

RATHBONE & PANICOT
PATENTEES
SOLE MAKERS — GRAND RAPIDS, MICH.

METER TALK
No. 42

ACTINIUM

through its scintillations is transformed into RADIUM; RADIUM, through its scintillations forms HELIUM, and HELIUM goes into lead or some other heavy metal. The element whose disintegration is responsible for ACTINIUM, we know naught of, as yet, but when the physicists discover it, it will be hailed as one of the world's greatest wonders.

This transformation of one element into another is most interesting and attracts the attention of everyone; but, when it comes to having a string tied to the bump of observation of the central-station fraternity, we believe we have a spell-binder in the DUNCAN METER, whose performance transforms the electrical energy of their plants into good, hard, solid, cold cash—100 cents on the dollar, too—and every time they install one, it makes them feel as if they were in bank and depositing its price. That's what counts. We make them to sell; send in your orders; they're gilt-edged and guaranteed; and their being used in every country on the globe means much.

Don't forget DUNCAN TRANSFORMERS.

Duncan Electric Mfg. Co.
LA FAYETTE, INDIANA

EXPERT ENGINEERS

Specify International Instruments because they are PERFECT in every detail. Made in all types, all ranges and for all purposes.

Our Catalog will interest you. Send for it.

INTERNATIONAL ELECTRIC METER CO.

CHICAGO, U. S. A.

Postal Telegraph Bldg. New York | Ideal Bldg. Denver | 9 So. 10th St. St. Louis | San Jose Bank Bldg. San Jose, Cal.

"SEEN EVERYWHERE"

WHAT?

2 IN SERIES 110 VOLTS

BUYERS

Out of every 10 Flaming Arcs in Chicago 9 are Excello Flaming Arc Lamps. We have installations from coast to coast. As a matter of protection to you, before buying, we suggest that you ask users what Flaming Arcs give absolute satisfaction.

Don't ask the manufacturers, ask the man that they work all night for. The answer is Excello: get convince yourself.

4 IN SERIES 220 VOLTS

EXCELLO ARC LAMP CO.

118-132 W. Jackson Blvd. CHICAGO | 30-32 East 20th Street NEW YORK

MINNEAPOLIS STEEL & MACHINERY CO.

MINNEAPOLIS, MINN.

Manufacturers of **Muenzel** Gas Engine and Gas Producer Power Plant

COMBINES BOTH HIGH ECONOMY AND PROVEN RELIABILITY. A BRAKE-HORSEPOWER BEING OBTAINABLE WITH THE GAS FROM ONE POUND OF COAL.

BELTED or DIRECT CONNECTED FOR ELECTRIC LIGHT PLANTS

WRITE FOR CATALOGUE "G"